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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicant(s): Smith, Jr.

Application No.: 10/701,146

Filed: 11/4/2003

Title: Cargo Oriented Aircraft

Attorney Docket No.: 50121

Art Unit:  
3644

Examiner:  
Tien Dinh

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

**Appeal Brief**

**(i) Real Party in Interest**

The named inventor, Frank C. Smith, is the real party in interest.

**(ii) Related Appeals and Interferences**

A prior appeal, appeal No. 2007-2901 was decided December 12, 2007. A copy of the appellate Decision is included herein in the **(x) Related Proceedings Appendix**.

**(iii) Status of Claims**

Claims 1-12 are pending, rejected and appealed. A copy of the claims on appeal is in the **(viii) Claims Appendix**

**(iv) Status of Amendments**

All amendments have been entered.

**(v) Summary of Claimed Subject Matter**

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**A. Terms Used**

(1) A “canard” is sometimes referred to as a “tail-first” aircraft. The term “two-surface” canard is used herein to refer to an aircraft having two, and only two, significant (i.e. non trivial, non de minimus) horizontal lifting surfaces (independent of the fuselage and any booms, to the extent they could be said to offer a lifting surface,) with the smaller lifting surface (the canard surface) in front (of the wing, of the larger lifting surface.) Spec 4 page line 29 – page 5 line 1. (Hence the “tail-first” moniker.)

(2) A “personal aircraft” is defined as an aircraft for six or less occupants and with a gross weight limit of 5000 pounds and a horsepower of less than or equal to 500 hp. Spec. page 5, lines 10-11.



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<b>TRANSMITTAL FORM</b> <i>(to be used for all correspondence after initial filing)</i>		Application Number	10/701,146
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		First Named Inventor	Smith, Jr., Frank C.
		Art Unit	3644
		Examiner Name	Tien Dinh
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<b>ENCLOSURES (Check all that apply)</b>			
<input type="checkbox"/> Fee Transmittal Form <input checked="" type="checkbox"/> Fee Attached <input type="checkbox"/> Amendment / Reply <input type="checkbox"/> After Final <input type="checkbox"/> Affidavits/declaration(s) <input type="checkbox"/> Extension of Time Request <input type="checkbox"/> Express Abandonment Request <input type="checkbox"/> Information Disclosure Statement <input type="checkbox"/> Certified Copy of Priority Document(s) <input type="checkbox"/> Reply to Missing Parts/ Incomplete Application <input type="checkbox"/> Reply to Missing Parts under 37 CFR 1.52 or 1.53	<input type="checkbox"/> Drawing(s) <input type="checkbox"/> Licensing-related Papers <input type="checkbox"/> Petition <input type="checkbox"/> Petition to Convert to a Provisional Application <input type="checkbox"/> Power of Attorney, Revocation <input type="checkbox"/> Change of Correspondence Address <input type="checkbox"/> Terminal Disclaimer <input type="checkbox"/> Request for Refund <input type="checkbox"/> CD, Number of CD(s) _____ <input type="checkbox"/> Landscape Table on CD	<input type="checkbox"/> After Allowance communication to TC <input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences <input checked="" type="checkbox"/> Appeal Communication to TC (Appeal Brief) <input type="checkbox"/> Proprietary Information <input type="checkbox"/> Status Letter <input type="checkbox"/> Other Enclosure(s) (please identify below):	
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<p>It is believed that no further request for extension of time or fees are due. Notwithstanding, the Commissioner is authorized to charge any additional fees incurred or credit any overage to Deposit Account No. 50-1753 (50121). Please regard this as a further request for extension of time to the extent one is needed. (Customer Account Number 22929).</p>			

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Firm Name	Shaper Iller LLP		
Signature			
Printed name	Sue Z. Shaper		
Date	December 4, 2009	Reg. No.	31663

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(3) "Large objects" for personal aircraft refer to such things as a patient on a gurney, a man in a wheelchair, a coffin (a.k.a. a casket), a motorcycle, a four-wheeled vehicle such as a golf cart or ATV, sheet of plywood, etc., any of which could be carried by a typical small private plane under its volume and weight limitations if only it could be loaded aboard. Spec. page 3, lines 1-4.

## **B. Summary of Claimed Subject Matter**

Appellant claims a cargo-oriented, personal aircraft comprising a ("tail-first") two-surface canard that includes a large opening at the rear of the fuselage for loading large (relatively speaking) objects into the aircraft. Spec. page 1, lines 5-7. Fig. 1A, 1B. The aircraft may have no empennage (no rear-fuselage control surfaces.) Spec. page 2 lines 5-8; page 3 lines 6-7.

## **C. Problem and Solution**

### **(1) Statement of Problem**

There is a need for a cargo-oriented personal aircraft. There is a need for a capacity to load large objects into a personal aircraft which are within the weight and volume limits of the fuselage. There is room, in a conventional personal aircraft, for a motorcycle, for instance, by volume and by weight, to solve the ground transportation need. However, there is no way to get the motorcycle into a conventional personal aircraft. Spec. page 1, lines 10-12; page 5 lines 6-9.

Rear fuselage doors are known, which permit loading bulky items, spec. page 1, lines 15-16, but aircraft designs incorporating rear fuselage doors utilize rear boom-supported empennages, like references Read and Rutan. Spec. page 1, lines 24-26; page 3, lines 9-13. Rear boom-supported empennages add too much weight, drag, expense and complexity to be practical in a personal aircraft. Spec. page 4 line 18.

### **(2) Solution and Path of Arriving at Solution**

The inventor fortuitously, personally, received evidence of what, he recognized, as "satisfactory flight" of a two-surface canard, which, he appreciated, was "effectively" without an empennage, and which, he appreciated, was "effectively" with a large rear cargo load, analogous to a motorcycle. Such evidence, adroitly interpreted, combined with his sensitivity to a long-felt need for ground transportation for private aircraft, led to the conception of the instant invention: a ("tail-first") two-surface canard with a large rear door for loading large (relatively speaking) cargo. Empennageless. There was no precedent for such craft, or public evidence of any such craft flying satisfactorily to his knowledge. The inventor had his own combination of personal experience, astutely interpreted, that substantiated the utility of his invention. Spec page 2 lines 3-8, 20-22; page 3 lines 6-16.

### **(vi) Grounds of Rejection to be Reviewed on Appeal**

I. The rejection of claims 1-12 under paragraph 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement by containing subject matter not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor, at the time the application was filed, had possession of the claimed invention; more particularly, the assertion

that claims 1 and 11 are misleading by incorporating the phrase “a two-surface canard, having two and only two significant horizontal lifting surfaces, with the smaller lifting surface in front of the larger lifting surface.”

II. The rejection of claims 1, 3-6 and 8-11 under 35 U.S.C. §103(a) as unpatentable over Rutan 4,641,800 in view of Rutan ATTT, and of defendant claims 2 and 12 further in view of Burnelli, and of claim 7 further in view of “admitted prior art” to the effect that successful testing of a canard aircraft with a single tractor engine was witnessed. Several “issues” will be identified under this ground.

**(vi) Argument**

**I. Ground of Rejection I - §112, first paragraph**

**A. Re: “a two-surface canard having two and only two significant horizontal lifting surfaces, with the smaller lifting surface in front of the larger lifting surface.”**

The Examiner erred in rejecting claims 1-12 under §112 first paragraph as failing to comply with the written description requirement. In particular, the Examiner errs in asserting that claims 1 and 11 are misleading in regard to the phrase “a two-surface canard having two and only two significant horizontal lifting surfaces, with the smaller lifting surface in front of the larger lifting surface.”

**(1) “Canard”**

The term canard is used in the industry in two senses. See attached definitions, Evidence Appendix, Attachment 1. “Canard” is used both for an airplane that has its horizontal stabilizer and elevators located forward of the wing (a so-called tail-first airplane) and for the so-called “canard wing” or “canard surface” itself, the small lifting wing located in front of the main wing. The instant specification analogously clarifies its use of “canard” and “canard surface,” see spec page 2 lines 24-28 and page 4 line 29 – page 5 line 3, as well as the June 17, 2004 amendment to the specification. Applicant clearly uses “canard” to refer to the “tail-first aircraft” design and uses the term “canard surface” to refer to only the smaller lifting surface. As indicated in the spec. page 5, line 29-30, consistently with the above, element 12 in the drawings is referred to as the “canard surface.” To ameliorate any possible confusion of a reader, applicant further amended claims 1 and 11 to add “two-surface” before the use of the word “canard.” Thus, the Examiner errs in rejecting claims 1-12 under §112 first paragraph as failing to comply with the written description requirement. In particular, the Examiner errs in asserting that claims 1 and 11 are misleading in regard to the phrase “a two-surface canard, having two and only two significant horizontal lifting surfaces, with the smaller lifting surface in front of the larger lifting surface.”

**(2) Procedural Issue**

First, Applicant responded to this rejection first in the June 17, 2004 Response to the First Office Action. Applicant’s June 17, 2004 Response contained a summary of an Examiner interview and an amendment to the specification, reciting:

In the following claims, when discussing a canard having two and only two significant lifting surfaces, with a smaller

lifting surface in front of a larger lifting surface, it should be understood that the smaller lifting surface is usually and frequently referred to as a “canard surface.” The larger lifting surface is usually and frequently referred to as a “wing.”

The Examiner did not continue to maintain the rejection subsequently. Applicant submits, thus, first, that the point is procedurally moot.

**(3) Substantive Issue**

According to dictionaries, the term “canard” may refer to either (1) flight control “surfaces” mounted at the front of an aircraft or to (2) an aircraft bearing such surfaces. See above referenced definitions of “canard” from Wikipedia, from Merriam-Webster online dictionary and from the Examiner’s own reference, dictionary.com, in Evidence Appendix, Attachment 1. See specification page 1 line 26 – page 2 line 2; page 2 lines 5-6 and lines 24-30; page 4, line 29 – page 5, line 3. See above referenced amendment to the specification filed June 17, 2004.

By the claim phrase “a two-surface canard, having two and only two significant horizontal lifting surfaces, with the smaller lifting surface in front of the larger lifting surface,” given the context in the specification, the skilled artisan would understand the smaller front lifting surface to be a “canard surface,” the larger lifting surface to be a “wing” and “a two-surface canard” to be a canard design having two and only two significant horizontal lifting surfaces. See specification page 2, lines 24-28; page 4, line 29 – page 5 line 3.

The Examiner errs in asserting that claims 1 and 11 are misleading by relying upon an unnecessarily narrow definition of “canard,” by his own dictionary evidence. The instant specification, (see above), together with the above referenced specification amendment and Examiner Interview Summary filed 6/17/04, and the above referenced dictionary definitions of record, all indicate that “canard” is used in two senses in the industry, and that instant specification clearly uses canard in the second sense, as the design of an aircraft, not in the narrower sense of a “canard surface.”

Applicant submits, in light of the dictionary definitions and evidence of record, indicating a proper and identified use of “canard” in the instant specification, the phrase in claims 1 and 11 of “a two-surface canard having two and only two significant horizontal lifting surfaces, with a smaller lifting surface in front of a larger lifting surface,” is not misleading.

**II. Ground of Rejection II - § 103(a)**

In regard to Ground of Rejection II, claims 1, 3, 4, 6 and 11 will be argued to some extent separately below. For the purposes of traversing asserted errors, different claims may be indicated as grouped together.

The Examiner’s rejection of claims 1, 3-6 and 8-11 over Rutan 4,641,800 in view of Rutan ATTT, is as follows:

“Rutan ['800] discloses that canards with pitch control surfaces on an aircraft with no empennages and two significant

horizontal surfaces are well known in the art. Rutan lacks the door at the rear of the fuselage. Rutan ATTT does teach using a door at the rear of the fuselage.

It would have been obvious to one skilled in the art at the time the invention was made to have used doors at the end of the fuselage in Rutan's ['800] system as taught by Rutan ATTT to easily load cargos.

RE amended claims 1 and 11, the motorcycle, patient on a gurney and a man in a wheelchair is merely intended use and carries no patentable weight. Plus, a "motorcycle, patient on a gurney and a man in a wheelchair" comes in many sizes. In addition, a weight limit of 5000 pounds and a hp limit of up to 500 hp is a design choice that one skilled would have chose to have optimized the desired mission of the aircraft. A change in the size of the aircraft that results in the weight limit of 500 and a change in the engine volume with a hp limit of 500 is within the level of ordinary skill in the art. See *in re Rose*, 105 USPQ 237 (CCPA 1955).

RE claim 6, the applicant has not provided any criticality of 5 feet high by 4 feet high and thus is merely a design choice. In fact, applicant has stated on page 3 line 29 of the specification that "10' x 5' x 4'" is not necessary to the design. Applicant seems to admit that the dimension is a design choice.

Pages 3-4, Action mailed 7/14/09, made final.

#### **A. Preliminary Matters**

##### **(1) The Examiner Errs in Refusing Patentable Weight to Size and Scale Limitations in the Claims 1, 6, 11**

The Examiner's error in refusing patentable weight to size and scale limitations in the claims affects the degree of modification necessary to the Rutan '800 in order to reach the claimed invention and relates to the predictability of the results after the modification.

The Examiner errs in finding that the phrase "motorcycle, patient on a gurney and a man in a wheel chair" of claims 1 or 11 merely recites intended use and carries no of patentable weight. To the contrary, the phrase "through which large objects, including at least one of a motorcycle, a patient on a gurney and a man in a wheel chair could be loaded," as recited in claims 1 and 11, gives context, meaning and definition to the phrase "large opening" and thus properly receives patentable weight.

Similarly, the Examiner errs in asserting that the weight limit of "5000 pounds" and a horsepower limit of "up to 500 hp," of claims 1 and 11, is a mere design choice, and that a change in the size of the aircraft that results in the above weight and horsepower limit is within the level of ordinary skill of the art.

Gross weight limit and horsepower limit place practical limitations on craft size, as recognized by one of ordinary skill in the art and further qualify why loading a motorcycle, a patient on a gurney, and a

man in a wheelchair would be regarded as a “large” object, presenting engineering and structural challenges to the design of such craft. The Examiner presents no evidence of the extent to which aircraft design scales up or down or not. The skilled artisan knows that limitations on horsepower and gross weight place engineering restrictions on designs and significantly affect scaling up or down. Applicant recites evidence below to the affect that aircraft design is not a predictable art, scaling up and down requires testing to substantiate results and in general results of significant changes are not predictable.

The Examiner errs in asserting that applicant has not provided any criticality of “five feet high by four feet wide,” of claims 1/6, 1/3/6, and thus such dimensions are merely a design choice. The phrase in an opening of “at least 5 feet high by 4 feet wide,” of claim 6, adds context, meaning and further definition to the recitation of an opening at the rear of the fuselage through which “large objects,” including at least one of a motorcycle, a patient on a gurney and a man in a wheel chair, can be loaded. The opening minimum size limitations read together with the craft maximum weight and power limitations provide criticality for the design features.

In sum, the phrases (1) “a personal aircraft having a gross weight limit of up to 5000 pounds and a hp limit of up to 500 hp”, of claims 1 and 11; (2) “through which large objects, including at least one of a motorcycle, a patient on a gurney and a man in a wheel chair, could be loaded,” of claims 1 and 11; and; (3) at least “5 feet high and 4 feet wide” of claim 6 ; all add context and structure to the terms “aircraft,” on the one hand, and “large opening”, on the other hand. “Criticality” is indicated for the size of the “large opening” by reciting on the one hand that the craft is a personal aircraft, having a gross weight limit of up to 5000 pounds and a horsepower limit of up to 500 horsepower, (or more, a light personal aircraft) and by reciting on the other hand that the large opening in the rear of the fuselage is an opening through which “at least one of a motorcycle, a patient or a gurney and a man in a wheelchair can be loaded”. To a person of ordinary skill, a limitation on gross weight and horsepower places engineering limitations on the size of the craft, including the fuselage. The size of the objects to be loaded as well as a minimum size of the opening of 5’x 4’ places minimum limitations on the size of the rear fuselage opening and the fuselage itself. A “criticality” of the size of the opening vis-à-vis the size of the craft is recited.

#### **(2) Aircraft Design Not a Predictable Art**

Aircraft design is not a predictable art. The skilled artisan knows by common experience that extensive test facilities exist, including wind tunnels and mathematical models, to determine viability of new designs. Favorable, satisfactory results from new combinations are not foregone conclusions. Satisfactory results of significant modifications cannot be predicted without testing.

Lack of predictability and the requirement for testing of modifications is taught and suggested by the following quotes from references relied on by the Examiner. E.g.: Rutan ‘800, column 3 lines 5-34:

“Despite these advantages [nine specific, apparently acknowledged, advantages of canard designs over conventional main wing forward, tail-aft designs], it has not been possible to

realize them in the design of modern complex high performance aircraft. For instance, if one were to equip one of the more common tandem-winged planes [canards] such as the Saab Viggen, V-70, Defiant, Quickie, VariViggen or even applicant's own Long-EZ with a set of high-lift flaps on its rear or primary wing system, the neutral point of the craft would move aft and the pitching moment would decrease beyond the ability of the secondary or forward wing system to compensate for it. In other words, to trim the aircraft to the angle of attack needed to achieve high lift, the secondary or canard wing system lacked the ability to provide same.

It has now been found in accordance with the teaching of the instant invention that these and other desirable performance characteristics of tandem or multi-winged [canard design] high performance aircraft can, in fact, be realized, not only in the high lift landing and take-off modes, but throughout the flight regime by the simple, yet unobvious expedient of sweeping the secondary wings fore and aft while leaving them deployed and effective at all times simultaneously and in carefully coordinated fashion with area-increasing flaps carried by and movable relative to the primary wing system. When and only when this coordinated movement is carried out through the entire range of flight modes does it become possibly to essentially maintain the necessary relationship between the aircraft's center of gravity and neutral point required for stable flight."

The Rutan quote informs the skilled artisan that notwithstanding nine significant advantages known for a canard, and that the canard design has been known since the Wright Brothers flight, it has not been possible to realize the theoretical canard advantages in a complex high performance aircraft. The skilled artisan is further informed that one can not simply add high lift flaps to a canard, or a canard surface to a high performance aircraft. In each case the performance of the combination has been shown to be poor. The quote provides concrete examples that "results" in aircraft design, especially in regard to canard design, are not predictable.

See also Wallis column 6 lines 33-51.

"The natural property of the body, when its longitudinal axis is inclined at a small angle to the airstream, of producing relatively large pitching moment with a negligible increase in drag is only realized when the wings are located towards the rear of the body. If the wings are attached to the body in the forward position, in the conventional manner, or even if small aerofoils are mounted at the extreme nose of the body, as in the "tail-first" [canard] aeroplane, this property is seriously interfered with, but if the attachment of any form of protuberance to the fore-body can be avoided, the preservation of an unimpeded airflow over the major portion of the body permits the latter to develop the full value of the pitching moment which is natural to it, so that the body itself can take the place of a conventional stabilizing surface in dynamic flight.

The Wallis quote also teaches the skilled artisan that Wallis' design only performs acceptably if no form of protuberance is attached to the fore-body, e.g. no canard. If small aerofoils are mounted at the extreme nose of the body, as in the tail-first airplane, (canard surface, a **combination contended to be "obvious" by the Examiner**), the property of producing a single pitching moment with negligible increase in drag is seriously interfered with. Wallis teaches that the attachment of any form of protuberance to the fore-body (e.g. canard surface) is to be avoided. Such evidences that modifications to aircraft design, like that proposed by the Examiner, can spell failure. Modifications must be tested. Results are not predictable

**(3) Summary of Knowledge of Skilled Artisan – See Evidence Appendix Attachments 3, 4 and 5, Especially Highlighted Portions, for Evidentiary Support**

The skilled artisan knows that the historic Beechcraft Starship prototypes are prototypes of the design disclosed in the Rutan '800 patent. Design patent No. 292,393, inventor Rutan, is also known by the skilled artisan to be a companion to, and to cover and disclose the design features of, the Rutan '800 utility patent. The Beechcraft Starship prototypes and the Rutan design Patent No. 292,393 both disclose a craft with an empennage, namely a rear vertical downward fin, fin 26. The skilled artisan, thus knows that the Rutan '800 discloses the downward vertical fin 26 rear aft, on the fuselage, which downward fin is taught to act both as a vertical stabilizer and as a "skid" to prevent damage to the props. Fin 26 would interfere with a rear fuselage door, and is incompatible with such door. Again, see Evidence Appendix Attachments 3 and 4. Further, the attachments evidence that the weight and power of the Beechcraft Starship prototype is at least twice that of the claimed upper limit of a "personal" aircraft.

The aft loading Rutan ATTT teaches a three-surface canard, having three significant horizontal lifting surfaces, and includes a traditional boom-supported empennage. The public development history of the ATTT teaches away from modifying a canard to add a large rear fuselage door without incorporating a three surface canard and boom-supported empennage. See Evidence Appendix Attachment 5.

By common knowledge, a canard design is "known" but not "familiar" to the skilled artisan. Not everything known is familiar, *per se*. The canard design is an oddity. The Wright brothers first plane was a canard, but aeronautical wisdom has subsequently taught that the design is disfavored. See below. The ordinary skilled artisan "knows," thus, but is not "familiar" with, a canard design. See also Evidence Appendix Attachment 6.

**B. Errors in Interpretation of Rutan '800**

Applicant traverses the rejection of claims 1, 3, 4, 6 and 11, in particular, over Rutan '800 in view of Rutan ATTT. The Rutan '800 contains a pair of rear pusher engines adjacent the fuselage which emulate a single rear-centered pusher engine. A door at the end of the '800 fuselage, thus, would be inoperable to load a motorcycle, a patient on a gurney and a man in a wheelchair, especially with the '800 scaled down to the size of a "personal" aircraft. The '800 further contains a downward vertical stabilizer

fin and skid, fin 26, at the rear end of the fuselage. This fin 26 also structurally inhibits placement there of a “large door.”

The Examiner errs in three ways (discussed more fully below) in interpreting the Rutan ‘800. (1) The Rutan ‘800 has an empennage, a downward vertical stabilizer, fin 26, located “amidships” (i.e. “along the center line” as per dictionary definition of “amidships”) at the end of the fuselage. Fin 26 operates not only as a conventional rear vertical stabilizer but also as a skid protector for the propellers against overrotation of the fuselage vis-à-vis the ground. (2) The Rutan ‘800 requires a significant scaling down to comprise a “personal” aircraft. (3) The Rutan ‘800 has twin, rear-centered pusher engines adjacent to the fuselage which inhibit installing a rear fuselage door. Altering the location of the twin pushers appears to destroy the ‘800 invention.

Such errors in interpreting the Rutan ‘800 significantly affect the degree of modification of the ‘800 required to reach the claimed invention. The absence of any basis for the predictability of successful results from such significant modifications is not acknowledged. The errors further result in failing to recognize that the modifications destroy the invention of the ‘800.

**(1) Error in Failure to Acknowledge that the Rutan ‘800 Teaches a Vertical Stabilizer on the Rear of the Fuselage, and thus an Empennage**

Applicant traverses the contention that the ‘800 “has no empennage.” As would be understood by one of ordinary skill in the art, the ‘800 has a downward vertical stabilizer on the aft end of the fuselage, a novel empennage, fin 26. See Evidence Appendix Attachments 3 and 4. Associated therewith, the Examiner errs in interpreting the Rutan ‘800’s use of the term “amidships.” The Examiner also errs in failing to acknowledge and appreciate that, in fact, both known two-surface canard designs with a tractor engine (Quickie/DragonFly) disclose a significant rear vertical stabilizer.

The Examiner errs in according too narrow a definition to the term “amidships” as used in the text by Rutan in the ‘800. As per dictionary definitions, amidships can refer either to (1) midway between the ends of a ship or aircraft or (2) to along the center fore and aft line of a ship or aircraft. See Evidence Appendix Attachment 2. It is clear from (1) the drawings of the ‘800 downward fin 26, (2) from the recitation in the text of the use of the ‘800 fin for a vertical stabilizer and as a skid to protect the propellers from overrotation of the aircraft, (3) from the pictures of the Beechcraft Starship known by the skilled artisan to be the prototype of the Rutan ‘800, and (4) from the design patent clearly identical to the Rutan ‘800; that Rutan uses “amidship” in the ‘800 specification in the second dictionary sense, above, to refer to along the center fore and aft line of the aircraft.

The Examiner errs, thus, in assessing the scope and content of the Rutan ‘800, and in assessing the differences between the ‘800 and the claimed invention. A rear vertical stabilizer is incompatible with a rear fuselage door. The Examiner errs, thus, alleging that the Rutan ‘800 discloses a two-surface canard with no empennage. The Examiner errs in asserting that it would have been obvious to have used doors at

the end of the fuselage in the Rutan '800 system as taught by Rutan ATTT. The Examiner presents no evidence why removing the vertical fin empennage, in order to add a rear door to the fuselage, would not change the functioning of the combination of elements and yield unpredictable results.

Applicant specifically traverses the contention that the Rutan '800 discloses an aircraft "with no empennages." See Rutan '800, Column 4 line 36-51.

In the particular form shown, the **conventional** empennage group has been eliminated in favor of a pair of so-called "Whitcomb-type" winglets 20 located at the tips of the fixed wing members 22 that make up the primary wing system 14 along with the extendable area-increasing elements 24. Winglets 20 extend vertically and provide directional stability **that is customarily a function of a vertical stabilizer located amidships on the aft end of the fuselage as a part of the empennage group.** A vertical fin 26 is provided amidships, however but, as shown in Fig 2 it projects vertically downward, not up. This fin is multi-functional in that it contributes some to the aerodynamic stability of the aircraft while, at the same time, acting as a skid to prevent the propellers 28 from hitting the ground during an inadvertent overrotation.

Again, "amidships" has two meanings; see dictionary definitions. Rutan uses "amidships" in the '800 quote above in the second sense, the sense of "along the central fore-and-aft line of a ship or aircraft." This is clear from the context. E.g. the "customary" vertical stabilizer is described as a vertical stabilizer located "amidships on the aft end of the fuselage," as part of the empennage group. The meaning of "amidships" thus must be compatible with location on the aft end of the fuselage. When Rutan uses "amidships," the term does not rule out the aft end of the fuselage. In the '800, Rutan discloses a novel vertical fin also located "amidships," that projects vertically downward. That novel fin 26 the skilled artisan knows is on the aft end of the fuselage, as is the customary vertical stabilizer. Supporting evidence informs one of ordinary skill that the novel fin 26 is located on the aft end of the fuselage. E.g.:

(1) The novel fin 26 is disclosed not only to provide aeronautical stability but also to act as a skid to prevent the propellers 28 from hitting the ground during an inadvertent overrotation. Common of a person of ordinary skill in the art locates a skid "to protect the propellers" adjacent to the propellers, where it must be located to perform its recited function. The location "adjacent to the props" is on the aft end of the fuselage of the '800.

(2) One of ordinary skill in the instant art, with deemed general knowledge and knowledge of relevant prior art knows that the Rutan '800 design is incorporated into the Beechcraft Starship prototype as well as the Rutan companion design patent No. 292,393. (See Evidence Appendix attachment 3 and 4. The Rutan '800 design was also the subject of a companion design patent. See Evidence Appendix, attachment 3). It was general knowledge in the relevant industry, and was reported in the relevant industry, that Burt Rutan was the designer of the Beechcraft Starship prototype (see attachment 3) and

that the Starship prototype corresponded to the Rutan '800 patent. (See attachments 3). The Beechcraft Starship prototypes clearly teach a lower vertical stabilizer on the rear aft end of the fuselage. (See attachment 4. Pictures of the Starship (again, see attachments 4) clearly locate the lower vertical stabilizer on the rear of the fuselage. Accord page 167 of "Canard a Revolution in Flight," (Book,) previously submitted.

Hence, by combination of deemed knowledge, general knowledge and common sense, the person of ordinary skill in the art knows that the '800 teaches a vertical stabilizer, fin 26, on the rear of the fuselage, a novel empennage. *In re Merck* warns, in regard to obviousness, that a reference is not to be read in isolation, but as a part of the prior art as a whole.

**(2) Error in Failure to Acknowledge that the '800 Must be Significantly Scaled Down as well as Extensively Altered**

The left and right prop tips of the '800 design, each appear about a foot off the longitudinal axis. Further, the swept back wings incorporate a tapered, narrowed rear fuselage. (See Evidence Appendix Attachments 3 and 4.) One of ordinary skill knows (Evidence Appendix attachment 3) that the '800 craft would have to be scaled down more than 50% to meet the claimed gross weight limit and horsepower limit of a personal aircraft.

Scaling the '800 down and adding a rear fuselage door sufficient to load at least one of a motorcycle, a patient on a gurney and a man in a wheelchair, would require, among other things, moving and redesigning the '800 thrust system together with its coordination with the retracted and extended positions, R and E, of the main and secondary wing system, Figs 2-4, which comprise the heart of the '800 invention.

To achieve applicant's design from the '800, the rear centered pusher engines would have to be moved and the rear vertical stabilizer fin and skid would have to be moved, both to accommodate the necessary rear fuselage door, and the coordination of the retracted and extended positions of the main and secondary wings would have to be altered. There is no reasonable expectation for successful flight. There are no predictable results. To the contrary, there are warnings in the '800 Rutan as to narrow limits of permissible variations on the '800 design. (See below quotes.)

Figs 3 and 6 show an allowable c.g. range C(F) to C(A) within which stable and controlled flight can be maintained.

More important, however, is the fact that moving one or the other [element 24 of the primary wing system and the sweep angles of the secondary wing system 16] brings about a change in the spaced relationship under any given set of conditions between the c.g and N.P. which, if allowed to exceed certain limits, will have an adverse effect upon the stability. In other words, regardless of the position of the c.g. within its predetermined allowable limits, there exists a narrow range of positions of the N.P. relative thereto which will result in stable, controllable trimmed flight.

In other words, were it not for this coordinated simultaneous deployment of these lifting surfaces into their fully-extended positions, the neutral point in the high-lift mode N(L) would, or at least could, shift forwardly of the center of gravity thus producing an unstable and unsafe flight condition.

Rutan '800 column 6 lines 60-62; column 7 lines 7-15; column 8 lines 34-39. Emphasis supplied.

The source of power and the source of vertical stabilization are significant forces impacting the '800 flight and stabilization. A relocation of those forces would necessitate, at the least, testing to determine maneuverability and stability of the craft under required flying circumstances.

**(3) Error in Failure to Acknowledged that the '800 Teaches Rear Pusher Engines Centered**

**Aft on the Fuselage – to Remove Such Destroys Invention**

The Rutan '800 discloses twin engine structured together as a rear centered pusher engine. Following the historically favored location of thrust or power for a canard, e.g., the rear centered pusher engine, the Rutan '800 incorporates a pair of very closely centered rear pusher engines, whose props virtually touch at the axis of a fuselage, synthesizing a centered rear pusher engine. Placing a large rear door in the '800 fuselage to load large objects, such as a motorcycle, a patient on a gurney and a man in a wheel chair, would require a radical redesign of the location for the thrust forces as applied to the frame of the Rutan '800. Moving the engines further down the wings in the '800 would further interfere with the flaps that comprise the essential element of the Rutan '800 invention. The Examiner offers no evidence that such redesign (or any other redesign) would fly.

The distance between the props of the rear centered '800 pusher engines, in particular if scaled down to the size of a "personal aircraft," is a foot or less and is incompatible in scale and safety with a large opening at the rear of the fuselage through which large objects, including at least one of a motorcycle, a patient on a gurney and a man in a wheel chair, could be loaded.

Again, if the aft centered power were moved further out on each wing, the operation of the flaps 24, crucial to the '800 invention, would be compromised. The location of, and relationship between, the center of gravity and neutral point (Figure 6) would be altered. Stable, controlled flight might be comprised. The '800 would likely no longer work for its intended purpose. The Examiner's proposed "combination of elements" does not provide a basis for a reasonable expectation of success for any such redesign, nor specify how it renders the '800 capable of operating for its intended purpose. Rutan cautions against such changes. The ATTT, discussed below, teaches away. There exists no evidence of successful flight with such modifications. The proposed modifications ignore that (1) the prior art of canards as a whole, and (2) the prior art of rear opening fuselages as a whole, and the ATTT developmental history in particular, all teach away from such re-configuration.

**Effect of Errors**

The instant combination thus is not a predictable use of prior art elements according to their “established functions.” The predictable use of a two-surface canard is with rear power and, or at least with, a rear vertical stabilizer. The predictable use of a rear fuselage door on small craft is with a boom-supported empennage. The elements of an aircraft affecting power, lift, center of gravity, neutral point, center of lift, horizontal stability, vertical stability, pitch, roll and yaw, function in combination. The functioning of a significantly new interrelationship is not “established.” It must be learned by testing.

Canard designs (tail-first craft) have existed for a hundred years and all designs employ at least one of (1) aft centered thrust; (2) aft centered vertical stabilizer; (3) a boom-supported empennage. The ATTT developmental history and the canard history, teach away from a two-surface canard with a rear fuselage door.

The instant invention is more than a predictable use of prior art elements according to their established functions (KSR) for the skilled artisan. A two-surface canard, personal aircraft and large rear fuselage door have been long known. They have never been combined as in the instant application. Whether the elements in combination produce satisfactory flight can only be evaluated in combination. The instant application is not a predictable use of prior art elements according to their established functions.

As taught *in re Merck*, a reference “must be read, not in isolation, but for what it fairly teaches in combination as a whole.” 800 F.2d 1091, 1097. The Rutan ‘800 reference, read in combination with the prior art as a whole, by the skilled artisan, teaches a rear vertical stabilizer and rear centered thrust. Both are incompatible with a large rear fuselage door on a personal sized aircraft. The Rutan ATTT developmental history, read in combination with the prior art as a whole by the skilled artisan, teaches away from a rear fuselage door on a two-surface canard. The prior art as a whole and the ‘800 in particular, teach away from the necessary modifications to elements in the prior art to reach applicant’s invention.

### **C. The Prior Art and in Particular the ATTT Teaches Away – in Two Senses**

Specifically, to accommodate aft loading, the Rutan ATTT teaches a three surface canard with a boom-supported empennage. See Evidence Appendix Attachment 5. One of ordinary skill in the art would be informed by the ATTT that to convert a historic two-surface canard design, including the Rutan ‘800, to an aft loading design, the craft should add a third lifting surface comprising a boom-supported empennage. The only specific evidence of modifying a canard to create aft loading, the ATTT, specifically teaches adding a third canard surface and the boom-supported empennage.

The prior art as a whole also teaches (1) away from a two-surface canard without a rear vertical stabilizer or a rear centered power source, or both; and (2) away from a rear fuselage door without a boom-supported empennage and a three-surface canard.

A reference may be said to teach away when a person of ordinary skill, upon reading the reference would be discouraged from the following

the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant. The degree of teaching away will of course depend on the particular facts; in general, a reference will teach away if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant. *In re Gurley*, 27 F.3d 551, 553 (Fed Cir 1994) emphasis supplied.

In considering the disclosure of a reference, it is proper to take into account not only specific teachings of the reference, but also the inferences which one skilled in the art would reasonably be expected to draw therefrom. *In re Preda*, 401 F.2d 825, 826-27 (CCPA 1968)

### **(1) Re Rear Centered Vertical Stabilizer and/or Power Source**

Review of the history of the development of canards, such as disclosed in the Book in an IDS submitted as a reference, "Canard a Revolution in Flight, (Book)" informs one of ordinary skill that all historical canard designs teach (a) rear centered thrust or (b) rear centered vertical stabilizer, or both. The Examiner has no evidence to the contrary. A person of ordinary skill, upon reading the references, would be "discouraged" from designing a canard without either a rear centered power or a rear centered vertical stabilizer, if not both, and would be "led in a direction divergent" thereto. The prior art suggests that applicant's design would be unlikely to be productive of satisfactory results. See Book.

### **(2) Re Rear Fuselage Door Without Boom-supported Empennage**

References relied on or cited by the Examiner, e.g. Weiland, Hawley, Weaver and the Rutan ATTT, all teach or suggest, or permit the skilled artisan to "reasonably infer," the necessity of either a conventional empennage or a boom-supported empennage, if the fuselage incorporates a rear door.

See Weaver Figure 1.

The Examiner references Weiland and Hawley, submitted as "pertinent" to applicant's disclosure, inform the skilled artisan. Hawley discusses the background and history of "tailless" craft and never recognizes a "tailless canard." Weiland discusses the background of rear-opening craft and never recognizes a "rear opening tailless" craft.

Hawley was filed 1997, assignee McDonald Douglas. Hawley teaches there are two types of aircraft, tailed and tailless. The conventional "tailed" figuration includes a tail section composed of a vertical and horizontal stabilizer located at the aft end of a tubular fuselage. "Tailless" craft are all cited to be of the "flying wing" type. Hawley does not teach, suggest, or in the slightest envision, a "two-surface canard" design for a "tailless" craft.

Weiland, assigned to Boeing, filed in 1959, teaches that rear openings "heretofore" have required mounting the empennage on booms or the like, column 1 lines 32-34; accord Weaver and Rutan ATTT. Weiland diverges from this teaching of the boom-supported empennage, by teaching a conventional empennage mounted on a "hinged rear door."

See Weiland column 1 lines 32-34 which specifically, teaches:

Rear end openings have heretofore required mounting the empennage, with its movable control surfaces, on booms or the like that can be built integral with the fuselage, leaving a stubby fuselage with a rear door that can open, for if the empennage were on a swingable tail section the control cables or like have to be disconnected for opening movement and reconnected at closing, requiring time for reconnection, and leaving open the possibility of human error and the disastrous failure of control that would follow.

Thus, Weiland teaches retaining a conventional empennage on a hinged rear fuselage door. Weiland teaches the skilled artisan the necessity and importance of a conventional empennage.

One of ordinary skill, informed thus by the teachings of Rutan as well as the Boeing and McDonald Douglas inventors, above, would be “discouraged” from creating a two-surface canard design without an empennage. Based on these disclosures, the skilled artisan would not expect satisfactory results from “a two-surface canard with a large rear door,” absent other evidence.

See, also, the Rutan ATTT developmental history, Evidence Appendix Attachment 5, of which one of ordinary skill in the relevant art can be presumed to be aware. E.g.

The initial flight test program consisted of 51 flights with the original cruciform tail configuration, measuring and refining performance, stability and control and handling qualities.

In an effort to improve the aft loading capability of the aircraft and to correct aerodynamic deficiencies discovered during the test program, the ATTT aircraft was modified with a twin boom tail.”

The ATTT development history teaches the importance and necessity of a three-surface canard. One of ordinary skill, with deemed knowledge of the prior art including the teachings of references Weaver and general knowledge of the ATTT developmental history, would be “discouraged,” therefore, from adding a rear fuselage door to a personal aircraft without adding a boom-supported empennage. Any canard design would result in a three-surface canard. A person of ordinary skill would be particularly led in the direction of the boom-supported empennage. The references suggest that the line of development pursued by applicant is “unlikely to be productive.” One of ordinary skill could be expected to “infer” that a personal two-surface canard with a rear door in the fuselage and with no empennage, would not fly satisfactorily.

The Examiner errs, thus, in asserting that it would have been obvious to combine the aft loading of the ATTT with the two-surface canard of the Rutan ‘800 (and implicitly to remove the ‘800 rear vertical stabilizer and fuselage centered pusher engine as mentioned above) to reach the claimed invention. The Examiner supplies inadequate evidence and reasoning supporting this impermissible, hindsight inspired, picking and choosing among prior art elements. The prior art in fact teaches the opposite. There is no basis for a reasonable expectation of success, or for predictable results, upon eliminating rear centered pusher engines and the rear centered vertical stabilizer and for not adding the third canard surface and

boom-supported empennage, as explicitly taught by the ATTT development history. The Examiner errs in failing to supply adequate motivation to make the asserted selective combination. The Examiner apparently accords no weight to the ATTT developmental history, specifically teaching of the importance of the three surface canard design and the boom-supported empennage, nor to the two-surface canard design developmental history, teaching the importance of a rear-centered pusher engine and/or a significant rear vertical stabilizer. The only motive for the Examiner's combination is the blueprint provided for the current invention, e.g. hindsight.

#### **D. Long-Felt Need and Fortuitous Personal Experience**

The instant inventor has regularly flown a private plane. The constant problem is transportation upon arrival, "the last five miles." Car rental and taxi services at private airports are problematic. Private pilots are known to borrow cars from airport managers, or locals are required to pick them up.

The invention occurred to the instant inventor subsequent to a fortuitous, personal discovery that a two-surface canard, which he appreciated was "effectively "empennageless," and which he appreciated carried an "effective" motorcycle-type rear load," flew what he appreciated was satisfactorily.

Although "canard control surfaces" have long been known (e.g. well known Wright brothers' first plane) Evidence Appendix Attachment 6 the general consensus of the industry is that their disadvantages outweigh their advantages, vis-à-vis empennage control surfaces. See for instance Rutan '245 column 2 line 27 through column 3 line 4 for the advantages of a canard and column 3 line 5 through line 17 for the disadvantages of a canard. See reference Sutton column 1 lines 29 through 36 for the disadvantages of a canard. The canard design thus is "known" to the ordinary skilled artisan but is not "familiar," and is generally regarded with disfavor. Since the net advantage of an "empennage-located control surface" has generally been believed to outweigh any advantages of a "canard control surface," the canard control surface is rarely seen.

However, the instant inventor appreciated, based upon a fortuitous combination of aeronautical training<sup>1</sup> and personal experience<sup>2</sup>, that the comparison of performance between a front and rear control surface was actually quite close. Thus, to gain a rear loading craft, a two-surface canard design could offer a practical and feasible solution.

To summarize, fortuitous coincidence of (1) long-felt need for a cost effective rear loading cargo-oriented private aircraft; (2) aeronautical engineering training; (3) unique acquaintanceship with canards; and (4) personal experience regarding an "effectively" empennageless two-surface canard flying

---

<sup>1</sup> The instant inventor has an aeronautical engineering degree from Cal Tech.

<sup>2</sup> The instant inventor has lifetime experiences that include flying a model canard, constructing a Burt Rutan experimental canard craft, accompanying Mr. Rutan flying an experimental canard, and being one of the "contributors" to the Burt Rutan Voyager project. (The Voyager was a canard design that set a world record by flying nonstop around the world without refueling.) Further, the instant inventor had personal experience that a two-surface canard, that was "effectively" empennageless, and that "effectively" carried a motorcycle rear cargo load, "effectively" flew satisfactorily.

“effectively” satisfactorily with an “effective” motorcycle-type rear load; all led to the instant invention: a cargo-oriented, rear loading, two-surface canard personal aircraft, providing for the loading of bulky items.

#### **E. Not Obvious to Combine – No Predictable Results**

##### **Claim 1**

The Examiner’s particular combination of elements: e.g. adding the ATTT “aft loading capability,” *per se* to the Rutan ‘800, as “a large opening at the rear of the fuselage through which large objects, including at least one of a motorcycle, a patient on a gurney, and a man in a wheelchair can be loaded,” without taking other features from the ATTT design, is improper. Adding such to the Rutan ‘800, *per se*, is also not feasible. Reasons: the location of the props of the ‘800 fuselage centered engines impermissibly interfere with such loading; the structural integrity of the ‘800 rear vertical stabilizer is compromised; the ‘800 embodiment would have to be scaled down at least 50%; and the engine and vertical stabilizer modification would destroy the ‘800 invention of extended and retracted wing elements. Further, the result ignores the teaching of the prior art. The teaching of the prior art ATTT developmental history, of which the skilled artisan is aware, and the Weaver reference, both teach that a large rear fuselage door goes hand in hand with a boom-supported empennage. No opposing teaching is offered. A boom-supported empennage violates the “two-surface canard” limitation. It also violates the “having no empennage” limitation of claims 3 and 4 and independent claim 11.

The modifications the Examiner is suggesting, explicitly and implicitly of the ‘800, necessary to reach applicant’s claim 1, are significant. The new combination is not known in the art. There is no precedent predicting favorable flight results. There is no reasonable expectation of success. The weight of the prior art teaches away from the modifications. The modifications are not a “predictable variation.” Successful testing at least would be required.

##### **Claims 3, 4 and 11**

The argument above as it applies to claim 1, applies in regard to claims 3, 4 and 11 with the addition of the limitation in the claim of the absence of an empennage.

##### **Claim 6**

The argument above in regard to claim 1 applies to claim 6 wherein the large opening is specified as at least five feet high by four feet wide.

The combination of particular, selectable elements from the Rutan ‘800 and the Rutan ATTT, required to reach the instant invention, amounts to an impermissible picking and choosing from the prior art using the instant invention as a blueprint. There is an absence of any evidence of predictable results or of a reasonable expectation of success from the selective combination outside of the instant disclosure. The combination ignores the “teaching away” of record, including the ATTT development as well as to historic two-surface canard design. The selective combination follows no “known method” of combining elements in the art, nor any “known technique” used to improve another aircraft.

The Examiner errs in finding that the invention of is “no more than a simple substitution” of one known element for another, or the application of a known technique to a piece of prior art which only unites old elements with no change in the respective function and that the combination of those elements yield predictable results and that there is no persuasive evidence that the combination of the above elements is uniquely challenging or difficult for one of ordinary skill in the art.

#### F. Conclusion

This appeal presents a classic case of “non-obvious to combine,” and of the lack of predictable results. The field is aeronautics. On the spectrum of predictable arts, aeronautics lies toward the “non-predictable” end. The cited references as a whole attest to a lack of predictableness in the aeronautical art in regard to modifications, and thus to the necessity of testing.

The two key references, combined by the Examiner, significantly teach away from the instant combination, as do other cited references. Both of the key references teach alternate different combinations and solutions.

Long-felt need is not disputed and key elements of the invention have been long “known,” yet the elements have never been combined as herein.

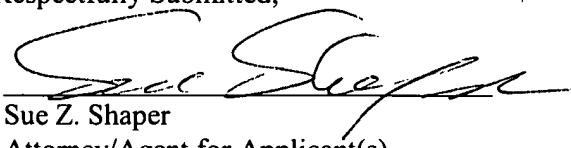
There is no credible motive presented to make applicant’s particular combination, given the teachings of the prior art, other than hindsight.

There is no demonstration of predictable results for the instant combination. Applicant’s contention of a lack of reasonable expectation of success is supported by the evidence of:

- (1) teaching away, the teaching of alternate combinations in the industry, including in both key references and in other cited references;
- (2) the long-felt need, wherein key elements of the invention have been long “known,” but the combination has never been made; and
- (3) the role of fortuitous personal experience in applicant’s personal inventive process.

Respectfully Submitted,

12/4/9  
Date

  
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**(viii) CLAIMS APPENDIX**



**(viii) CLAIMS APPENDIX**  
**CLAIMS INCLUDED IN APPEAL**

What is claimed is:

1. A cargo adapted personal aircraft, comprising:
  - a two-surface canard having two and only two significant horizontal lifting surfaces, with a smaller lifting surface in front of a larger lifting surface;
  - a large opening at the rear of the fuselage through which large objects, including at least one of a motorcycle, a patient on a gurney and a man in a wheelchair can be loaded, the opening having a closure for flight, the personal aircraft having a gross weight limit of up to 5000 pounds and a hp limit of up to 500 hp.
2. The aircraft of claim 1 including yaw control surfaces on the larger lifting surface.
3. The aircraft of claim 1 having no empennage.
4. The aircraft of claim 2 having no empennage.
5. The aircraft of claims 1, 2, 3 or 4 wherein the aircraft is a light personal aircraft.
6. The aircraft of claims 1, 2, 3 or 4 wherein the large opening is at least 5 feet high by 4 feet wide.
7. The aircraft of claims 1, 2, 3 or 4 that includes one tractor engine.
8. The aircraft of claims 1, 2, 3 or 4 that includes two engines located on the larger lifting surface.
9. The aircraft of claims 1 or 2 without a boom-supported empennage.
10. The aircraft of claims 1 or 2 including a pitch control surface on the smaller horizontal lifting surfaces.
11. A cargo-adapted personal aircraft, comprising:
  - a two-surface canard having two significant horizontal lifting surfaces with a smaller lifting surface in front of a larger lifting surface;
  - a large opening at the rear of the fuselage through which objects, including at least one of a motorcycle, a patient on a gurney and a man in a wheelchair, can be loaded, the personal aircraft having a gross weight limit of up to 5000 pounds and a hp limit of up to 500 hp; and
  - having no empennage.
12. The aircraft of claim 11 including power sources and yaw control surfaces, all said power sources and yaw control surfaces being attached to the aircraft at a location at least as far forward as the larger lifting surface.

**(ix) EVIDENCE APPENDIX**

**Attachment 1**

**Submitted in Response filed March 18, 2009  
to Office Action mailed February 18, 2009,  
“Entered” by the Examiner’s Subsequent Office Action of July 13, 2009**

# Canard

From [Wikipedia](#), the free encyclopedia

**Canard** is a French word for a duck, and is often used in English to refer to a deliberately false story, originating from an abbreviated form of an old French idiom, "*vendre un canard à moitié*," meaning "to half-sell a duck." In French it can also mean a journal. It may refer to:

- Canard (aeronautics), flight control surfaces mounted at the front of an aircraft or an aircraft bearing such surfaces
- *Le Canard enchaîné*, a satirical French newspaper. The newspaper itself gave birth to another meaning for canard: newspaper.
- Canard (dynamical systems), is a phenomenon in some slow-fast dynamical systems referring to high sensitivity of a periodic orbit to a parameter [1] (<http://www.scholarpedia.org/article/Canards>). Canards are used in some models of neuronal spiking.

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**Main Entry:** **ca·nard** •

**Pronunciation:** \kə-'närd also -'när\

**Function:** *noun*

**Etymology:** French, literally, duck; in sense 1, from Middle French *vendre des canards à moitié* to cheat, literally, to half-sell ducks

**Date:** 1851

**1 a** : a false or unfounded report or story ; *especially* : a fabricated report. **b** : a groundless rumor or belief

**2** : an airplane with horizontal stabilizing and control surfaces in front of supporting surfaces ; also : a small airfoil in front of the wing of an aircraft that can increase the aircraft's performance

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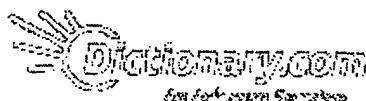
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[kuh-nahrd; Fr. ka-nar] Show IPA

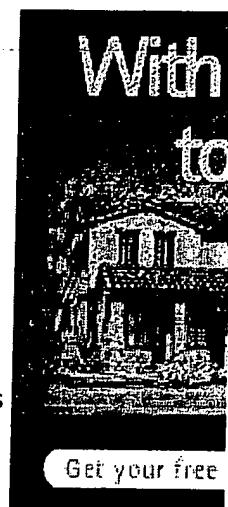
-noun, plural -nards [-nahrdz; Fr. -nar] Show IPA

1. a false or baseless, usually derogatory story, report, or rumor.

2. Cookery. a duck intended or used for food.

Aeronautics.

- a. an airplane that has its horizontal stabilizer and elevators located forward of the wing.
- b. Also called canard wing. one of two small lifting wings located in front of the main wings.
- c. an early airplane having a pusher engine with the rudder and elevator assembly in front of the wings.

**Origin:**

1840–50; < F: lit., duck; OF quanart drake, orig. cackler, equiv. to can(er) to cackle (of expressive orig.) + -art -ART, as in mallart drake; see **MALLARD**

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[Cite This Source](#) Language Translation for : **canard**Spanish: **pato**, German: **die Ente**,

Japanese:

[More Translations »](#)**ca▪nard** (kə-närd') Pronunciation Key

n.

1. An unfounded or false, deliberately misleading story.
- 2.

- a. A short winglike control surface projecting from the

fuselage of an aircraft, such as a space shuttle, mounted forward of the main wing and serving as a horizontal stabilizer.

b. An aircraft whose horizontal stabilizing surfaces are forward of the main wing.

[French, *duck, canard*, probably from the phrase *vendre un canard à moitié*, *to sell half a duck, to swindle*, from Old French *quanart*, *duck*, from *caner*, *to cackle, of imitative origin*.]

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## Canard

Ca\*nard"\, n. [F., properly, a duck.] An extravagant or absurd report or story; a fabricated sensational report or statement; esp. one set afloat in the newspapers to hoax the public.

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## canard

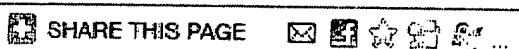
*noun*  
a deliberately misleading fabrication

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## canard

before 1850, from Fr. "a hoax," lit. "a duck," said by Littré to be from the phrase *vendre un canard à moitié* "to half-sell a duck," thus, from some long-forgotten joke, "to cheat." From O.Fr. *quanart*, probably echoic of a duck's quack.

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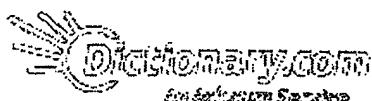
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**Submitted in Response filed March 18, 2009  
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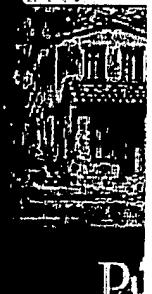
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## a·mid·ships [uh-mid-ships] [Show IPA](#)

### -adverb

1. in or toward the middle part of a ship or aircraft; midway between the ends.
2. along the central fore-and-aft line of a ship or aircraft.
3. in or toward the center of anything: *a long, narrow office with a desk placed amidships.*

### -adjective

4. of, pertaining to, or located in the middle part of a ship or aircraft.

Also, *a·mid·ship*.

### Origin:

1685-95; AMID + SHIP + -S<sup>1</sup>

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adv. Midway between the bow and the stern.

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**Amidships**

A\*mid"ships\, adv. (Naut.) In the middle of a ship, with regard to her length, and sometimes also her breadth. --Totten.

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**amidships***adverb*

at or near or toward the center of a ship; "in the late 19th century, engines were placed in front, amidships, and at the rear"

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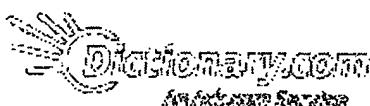
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### a□mid□ships

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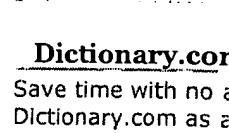
-adverb

1. in or toward the middle part of a ship or aircraft; midway between the ends.
2. along the central fore-and-aft line of a ship or aircraft.
3. in or toward the center of anything: a long, narrow office with a desk placed amidships.

-adjective

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Also, a□mid□ship.



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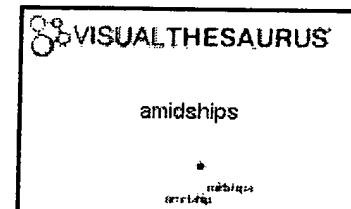
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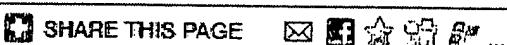
A\*mid"ships\, adv. (Naut.) In the middle of a ship, with regard to her length, and sometimes also her breadth. --Totten.

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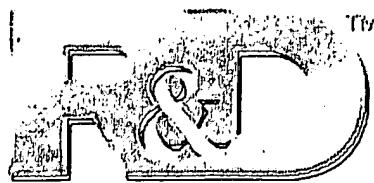
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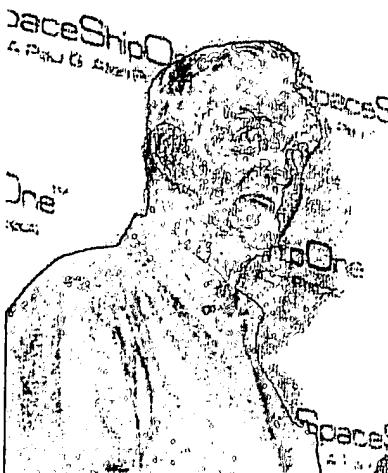
**Attachment 3**

**Submitted in Response filed March 18, 2009  
to Office Action mailed February 18, 2009,  
“Entered” by the Examiner’s Subsequent Office Action of July 13, 2009**



## Burt Rutan Takes Us to the Stars

Driven by the recent success of SpaceShipOne, Burt Rutan seeks to show the world his dream of a space tourism industry—and make it come true.



and Stuart Parkin, IBM (Spintronics).

### Pushing the envelope

As president/CEO of Scaled Composites, Mojave, Calif. (see sidebar), Burt Rutan credits his mentor Wernher von Braun the first director of NASA's Marshall Space Flight Center with teaching him that people can set their sights extremely high and then go for them.

### The company behind the man

Scaled Composites is an aerospace and specialty composites development company located in Mojave, Calif. Founded in April 1982 by Burt Rutan, Scaled has a broad experience in air vehicle design, tooling and manufacturing, specialty composite structure design, analysis and fabrication, and developmental flight testing.

In June 1985, Scaled was sold to Beech Aircraft Corp., acquired by Wyman-Gordon Co., North Grafton, Mass., in January 1989, and then sold to 11 private investors (including Rutan) in September 2000. Rutan has been president/CEO since its formation in 1982.

The company is headquartered in three flight line buildings located on the Mojave Airport and employs 130 people. Since most of the projects done by Scaled are proprietary to the customer, the facility is closed to the public.

Burt Rutan knows what he wants and he doesn't aim low. "I would like to achieve a goal that NASA has neglected: to make flight outside the atmosphere accessible to common man by making sub-orbital flights available to 'space tourists,'" he says. Rutan is not alone in this dream. According to a study by the Bethesda, Md.-consulting firm Futron Corp., a forecast for suborbital space travel predicts that by 2021, more than 15,000 passengers could be flying annually, generating revenues in excess of \$700 million.

It is Rutan's contributions to this goal along with his countless innovative aerospace designs that have earned him R&D Magazine's 2004 Innovator of the Year award. He joins the ranks of previous winners Larry Page, Google; Ian Foster, Argonne (Globus Toolkit);

In the early 1970s, as director of the Bede Test Center, Bede Aircraft, Newton, Kan., Rutan was responsible for the design and development of the BD-5J jet, the world's smallest private jet aircraft.

After founding Scaled Composites in 1982, Rutan embarked on his most expensive project, the Beech Starship. It turned out to be just one in a series of his trademark experimental and unique aircraft designs. The most notable was Beech's Model 2000 Starship, an all-composite craft that used rudders on upturned "winglets" at the end of each wing (instead of a conventional tail), in addition to a variable-sweep canard. The result was a high-performance, stall-free aircraft that accommodated two pilots and eight passengers and could keep up with small business jets.

When asked of his most pivotal project that changed the way people regard aircraft design, Rutan feels it is certainly the Voyager aircraft, which made history in 1986 with its around the world, non-refueled flight doubling an existing range record. However, when speaking of his single largest success, Rutan knows it happened on June 21, 2004.

On that day, SpaceShipOne hitched a ride beneath the White Knight, a matching jet-powered aircraft, which carried the rocket to an altitude of about

### Looking to the prize

In 1995, Peter Diamandis, a communications and aerospace entrepreneur and chairman, president, and founder of the X PRIZE Foundation, proposed the idea that a prize be offered to the first private team to develop a ship that will "jump start the space tourism industry." In May 1996, the X PRIZE was announced: \$10 million to the first team able to privately finance and build a ship capable of flying three people to 100 km altitude, twice within a two-week period, and returning safely to earth. Currently, 26 teams from seven nations are competing.

In his testimony to the House Subcommittee on Space and Aeronautics (July 15, 2003)

Diamandis attributed the success of the X Prize to three key components: the rules, which were well thought through and clearly presented; the "romance and excitement involved with the prize topic;" and the existence of a business or market to support the teams after the prize was won.

Although SpaceShipOne's flight on June 21st did not qualify as an ANSARI X PRIZE flight since it only carried one pilot, it was needed preparation for the competition flight attempts Scaled Composites plans to make this September and October.

### Burt Rutan

**Current position:** Founder and president/CEO of Scaled Composites,

15 km before being released. Climbing to an altitude of 100 km, SpaceShipOne took only 25 mins to make its way into history as the first non-government supported manned flight to exit Earth's atmosphere. Credited as the most fun, yet most difficult project that he has ever worked on, Rutan and his team at Scaled Composites plan to enter this innovative aircraft (entirely funded by Paul Allen, co-founder of Microsoft) into the ANSARI X PRIZE contest (see sidebar).

"I think that the SpaceShipOne flight is by far much more significant than the around the world Voyager flight," he says. "The main reason is that while the Voyager flight was a significant aerospace milestone, it didn't lead to anything. I think this is going to lead to a new space race, or a new space age and one that people can enjoy, instead of just the government and astronauts."

"The U.S. has an enormous capability because it sends engineers out to be entrepreneurs, and that's why we've excelled at things like software and computers," he adds. "I believe that same talent, applied to space travel, is going to be the next really big thing, whereas computers have been the 'big thing' over the last 20 years. I expect to see the U.S. as the leader in providing affordable space access in the future."

#### **The first but not the last**

More recently, Rutan, working with Richard Branson and Virgin Atlantic Airways, has designed the Virgin Atlantic GlobalFlyer. Built by Scaled Composites, the new GlobalFlyer is a turbofan aircraft fitted for a single pilot and engine. The ultra-light plane is made entirely from composite materials and can carry more than four times its own weight in fuel. Debuted in January, it had a successful test run in March, and hopes to set the world record for the first solo, non-stop, non-refuelled circumnavigation of the world later this year.

Rutan is understandably hush-hush on any future projects, but feels that his company will take a similar approach to those as they did with his latest project, SpaceShipOne, which was unveiled after being in design for eight years and under development for two years.

Burt, we can't wait.

--Lorraine Joyce

ANSARI X PRIZE, [www.xprize.com](http://www.xprize.com)

Futron Corp., 301-913-9372, [www.scaled.com](http://www.scaled.com)

Virgin Atlantic GlobalFlyer, [www.virginatlanticglobalflyer.com](http://www.virginatlanticglobalflyer.com)

Mojave, Calif. (privately-owned)  
**Education:** B.S. Aeronautical Engineering, California Polytechnic Univ., third in graduating class; Space Technology Institute, California Institute of Technology; Academic portion of Aerospace Research Pilots School, Edwards Air Force Base.

**Member:** Experimental Aircraft Association; Society of Experimental Test Pilots; American Inst. of Aeronautics & Astronautics; Society of Flight Test Engineers; Academy of Model Aeronautics; International Order of Characters; Aircraft Owners and Pilots Association; National Academy of Engineering.

**Awards:** "Business Leader in Aerospace" presented by Scientific American, November 10, 2003; The Reed Aeronautics Award presented by the American Institute of Aeronautics and Astronautics, May 9, 2001; Presidential Citizen's Medal presented by Ronald Reagan, December 29, 1986, for the design/development of the Voyager "around-the-world aircraft."

**Projects:** White Knight (an airborne launch aircraft) and SpaceShipOne (a three-person, high-altitude research rocket); Virgin Atlantic GlobalFlyer (aiming to set a world record for the first solo, non-stop, non-refueled circumnavigation of the world); Proteus (high altitude long endurance aircraft) for different scientific missions; Voyager aircraft (designed by Rutan Aircraft Factory Inc., Mojave, Calif.).

**Patents held:** Grizzly wide-chord flap suspension system, U.S. Patent Number 4,614,320; Variable geometry high-lift system incorporated in the Beech Starship, U.S. Patent Number 4,641,800 (foreign patents also held); Rutan Model 115 Starship configuration, U.S. Patent Number Des. 292,393 (foreign patents also held)

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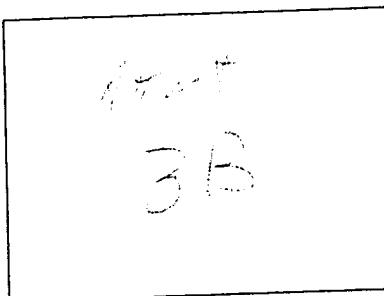
# Beechcraft Starship

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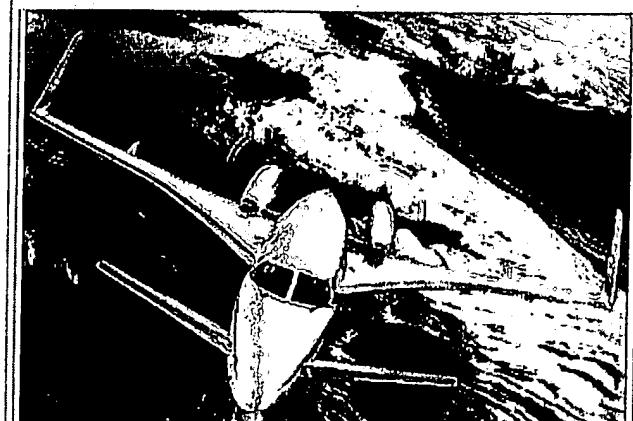
The **Beechcraft Starship** is a futuristic-looking United States turboprop-powered six- to eight-passenger seat business aircraft. The design was originated by Beechcraft in January 1980 as Preliminary Design 330 (PD 330). Burt Rutan was subsequently retained to refine PD330 and one of the significant changes he instituted was the addition of variable geometry to the canard (he holds a patent for this). Rutan's California-based design and fabrication company Scaled Composites was then contracted to build scale-model prototypes to aid in development.

## Contents

- 1 Development
- 2 Design
- 3 Operational history
  - 3.1 Sales
  - 3.2 End of the program
- 4 Specifications (2000A)
- 5 See also
- 6 References
- 7 External links



### Model 2000 Starship



<b>Role</b>	Executive transport
<b>Manufacturer</b>	Beech Aircraft Corporation
<b>Designed by</b>	Burt Rutan
<b>First flight</b>	15 February 1986
<b>Number built</b>	53
<b>Unit cost</b>	US\$3.9 million

## Development

Work began in 1979 when Beechcraft identified a need to replace the King Air 200 model. After a brief hiatus while the company was being bought by Raytheon, full development began in 1982 when Beechcraft approached Burt Rutan of Scaled Composites, a leader in the field of novel composite aircraft design. Much of the design work utilised computer-aided design, using the CATIA system.

While in development at Scaled Composites, the 85%-scale prototype was the **Model 115**, and Beechcraft referred to the production version as the **Model 2000**. The Model 115 first flew in late August 1983. However, this aircraft had no pressurization system, no certified avionics, and a different airframe design and material specifications than the planned production Model 2000. Only one Model 115 was built, and it has since been scrapped.

The first full-size Starship (the Model 2000) flew on February 15, 1986. Prototypes were produced even as development work was continuing — a system demanded by the use of composite materials, as the tooling required is very expensive and has to be built for production use from the outset. The program was delayed several times, at first due to underestimating the development complexity involved and later to overcome technical difficulties concerning the stall-warning system.

The first production Starship flew in late 1988, after over \$300 million in development costs. Those working in the program have stated that much of the development delay was due to the new owners' ongoing vacillation and lack of assurance over whether to continue with the new-concept project.

## Design

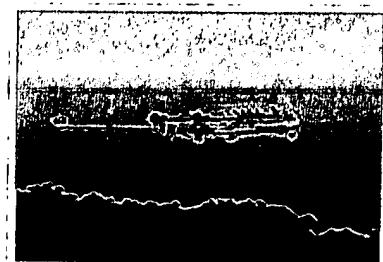
The Starship was notable for several reasons:

- Its all-graphite composite airframe, using high-tech materials instead of aluminum. These materials were in frequent use to varying degrees on military aircraft, but no civilian aircraft certified by the US Federal Aviation Administration had ever used them so extensively. Composites were chosen to reduce the weight of the aircraft and to provide exceptional surface smoothness. However, the empty weight of production aircraft considerably exceeded the target.
- Its canard design, with the lifting surface aft of the horizontal stabilizer. As configured, the Starship cannot be stalled - the forward surface stalls before the main lifting surface, which allows the nose to drop and more-normal flight to resume.
- Its lack of a conventional centrally placed vertical tail. Its two vertical surfaces are mounted at the tips of the swept wings, which places the rudders well aft of the aircraft's center of gravity.
- Its pusher design, with the turboprop engines mounted facing the rear, pushing rather than pulling the aircraft. This design has the potential of a quieter ride, since the propellers are far removed from the passengers and because vortices from the propeller tips do not strike the fuselage sides. However, the propellers are operating in a turbulent airflow in the pusher configuration (due to airflow past the wings moving aft in vortex sheets), and thus the resulting propeller noise is more choppy and raucous than otherwise.
- Flight instrumentation for the Starship included a 16-tube Proline 4 AMS-850 "glass cockpit" supplied by Rockwell Collins, an early application of this concept in small civil aircraft.

## Operational history

### Sales

Commercially, the aircraft was a failure, with little demand. Only fifty-three Starships were ever built, and of those only a handful were sold. Many of the aircraft were eventually leased by Raytheon, which allowed the company to control their distribution and operational life. Raytheon considered the cost of supporting a commercial fleet of just 53 aircraft with necessary parts and flight training to be prohibitive. Leasing the aircraft allowed Raytheon to effectively recall and ground most of the fleet at the end of their initial leases.



Beechcraft Starship

Some reasons for the lack of demand:

- Price. 1989 list price for a Starship was \$3.9 million, similar to the Cessna Citation and Learjet 31, which were pure jets of similar carrying capacity and range. The Piper Cheyenne, a turboprop airplane of similar capacity, was less expensive (\$2.9 million).<sup>[1]</sup>
- Performance. The Starship was 89 knots (165 km/h) slower than the Cessna Citation. It was 124 knots (230 km/h) slower than the Learjet 31. The turboprop-powered Piper Cheyenne was also faster than the Starship. The turboprop-powered Italian Piaggio P.180 Avanti had a configuration somewhat similar to the Starship (it incorporated a canard as well as a conventional tailplane) and comparable capacity, but was faster.
- Economic conditions. The Starship was finally introduced as the US economy was entering a periodic slowdown, and sales of all high-ticket items such as business transportation vehicles were off.
- Undesirable characteristics. Several pilots who tried flying the Starship noted its significant phugoid tendency, in which the nose continually rises and falls during otherwise level flight, as if "hunting" for the correct flight attitude.

## End of the program

In 2003, Beechcraft deemed that the aircraft was no longer popular enough to justify its support costs, and has recalled all leased aircraft for scrapping. The company was also said to be buying back privately-owned Starships, though some Starship owners say they have never been contacted by Raytheon about this. Raytheon's spin-off, *Hawker Beech Corporation*, continues to offer technical support by phone but no longer offers parts support to current Starship operators. Rockwell Collins has maintained full support for the AMS-850 avionics suite. In March 2008, the third of the five remaining Starships completed RVSM certification returning the aircraft's service ceiling to the original FL410 limit.

Almost all of the recalled Starships have been ground up and incinerated at the "boneyard" at the Evergreen Air Center (<http://www.evergreenac.com/about.html>) located at the Pinal Airpark in Arizona. The planes have little aluminum for recycling. A few have been purchased by individuals who regard them as lovable failures, much like the infamous Ford Edsel. Starship Model 2000A NC-51 was used as a chase plane during the re-entry phase of Burt Rutan's SpaceShipOne. Several Starships have been donated to museums since the decommissioning program began, with the Kansas Aviation Museum receiving the first aircraft in August 2003. Starship NC-42, flown by the architect David Schwarz for many years, is now at the Museum of Flight in Everett, Washington. Starship N214JB is displayed at the Southern Museum of Flight adjacent to the Birmingham International Airport in Alabama.

As of autumn 2008 only six Starships continue to hold airworthiness registration with the FAA. Three Starships are based in Oklahoma, one in Washington, one in California, and one is still registered to Raytheon Aircraft Credit Corporation in Wichita, Kansas.

## Specifications (2000A)

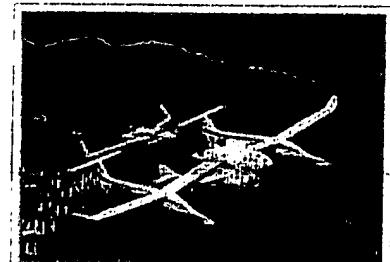
*Data from Beechcraft Starship 2000A Performance, Specifications & Equipment<sup>[2]</sup>*

### General characteristics

- **Crew:** one or two pilots
- **Capacity:** 8 passengers
- **Length:** 46 ft 1 in (14.05 m)
- **Wingspan:** 54 ft 4.7 in (16.58 m)
- **Height:** 12 ft 11 in (3.94 m)
- **Wing area:** 280.88 ft<sup>2</sup> (26.1 m<sup>2</sup>)
- **Empty weight:** 10,120 lb (4,590 kg)
- **Loaded weight:** 15,010 lb (6,823 kg)
- **Max takeoff weight:** 14,900 lb (6,760 kg)
- **Powerplant:** 2× Pratt & Whitney Canada PT6A-67A Turbo-props, 1,200 shp (895 kW) each
- **Propellers:** 5-bladed McCauley propeller

### Performance

- **Maximum speed:** 335 knots .60 mach (385 mph, 620 km/h)
- **Stall speed:** Un-stallable (Un-spinable)
- **Range:** 1,576 nm (1,814 mi, 2,920 km)
- **Service ceiling:** 41,000 ft (12,500 m)
- **Rate of climb:** 2,748 ft/min (13.96 m/s)
- **Wing loading:** 53.0 lb/ft<sup>2</sup> (258.77 kg/m<sup>2</sup>)
- **Power/mass:** 6.21 lb/shp (3.78 kg/kW)



A Beechcraft Starship chasing a Scaled Composites SpaceShipOne during a test flight

## See also

### Comparable aircraft

- AASI Jetcruzer
- Piaggio P.180 Avanti

## References

1. ^ *Aviation Week & Space Technology*. October 2, 1989.
2. ^ "Beechcraft Starship 2000A Performance, Specifications & Equipment" (<http://www.starshipdiaries.com/specifications.html>). <http://www.starshipdiaries.com/specifications.html>.

## External links

- The Starship Diaries (<http://www.starshipdiaries.com/starship.html>)
- A Collection of Beechcraft Starship 2000A Material (<http://www.bobscherer.com/Pages/Starship.htm>)

Retrieved from "[http://en.wikipedia.org/wiki/Beechcraft\\_Starship](http://en.wikipedia.org/wiki/Beechcraft_Starship)"

Categories: Canard aircraft | United States civil utility aircraft 1980-1989

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**Burt Rutan**  
Aerospace Engineer, *SpaceShipOne* • CEO, *Scaled Composites*

See last page

## Curriculum Vitae

### EDUCATION

1. B.S. Aeronautical Engineering, California Polytechnic University, 1961-1965. Third in graduating class.
2. Space Technology Institute, California Institute of Technology, 1964.
3. Marketing and Personnel Management graduate level courses, Golden Gate College, 1968-1969.
4. Academic portion of Aerospace Research Pilots School, Edwards AFB, 1965.
5. Doctoral of Science, honoris causa, Daniel Webster College, 17 May 1987.
6. Honorary Doctor of Science, California Polytechnic University, San Luis Obispo, 13 June 1987.
7. Doctoral of Humanities, honoris causa, Lewis University, 22 May 1988.
8. Doctoral of Technology, honoris causa, Delft University of Technology, 12 January 1990.
9. Doctoral of Engineering, honoris causa, University of Illinois, June 2006.

### PROFESSIONAL ORGANIZATIONS

1. Experimental Aircraft Association
2. Society of Experimental Test Pilots
3. Amer. Inst. Aeronautics & Astronautics
4. Society of Flight Test Engineers
5. Academy of Model Aeronautics
6. International Order of Characters
7. Aircraft Owners and Pilots Assn.
8. National Academy of Engineering



### BURT RUTAN'S COMPANIES:

#### **Scaled Composites - April 1982 to present:**

In April 1982, Mr. Rutan founded Scaled Composites Incorporated to develop research aircraft. The company employs 130 people in four flight line buildings located on the Mojave Airport. Most of the projects done by Scaled are proprietary to the customer; therefore the facility is closed to the public. A list showing many of Scaled's major projects follows:

- A single-place, twin-jet research aircraft for Fairchild Republic Company (the subscale T-46A demonstrator).

- A two-place, single-engine recreational aircraft for Group Lotus, Ltd. the Microlight POC.
- A twin-turboprop high-performance business aircraft, the sub-scale Starship I POC for customer Beechcraft.
- A large agricultural aircraft, Predator POC.
- The CM-44 POC reconnaissance aircraft.
- A tandem-wing, three-surface technology demonstration aircraft for DARPA (the Advanced Technology Tactical Transport-62% scale ATTT POC).
- Prototypes and the first production run (28 vehicles) of an all-composite remotely-piloted reconnaissance vehicle, the Teledyne Ryan Aeronautical Model 324 Scarab.
- An 85-foot and 108-foot span rigid sail/airfoil for the America's Cup Challenge Race.
- The Triumph, an all-composite cabin-class twin jet aircraft for Beechcraft.
- The ARES, an all-composite single-seat jet attack aircraft, designed for anti-helicopter, close air support, reconnaissance, training, and other missions.
- The Pond Racer, and entry into the piston-powered unlimited category aircraft racing arena.
- The Orbital Sciences Pegasus rocket wing, fillets and fins (structural design, tooling, and manufacture of more than 40 ship-sets).
- The Earthwinds gondola for a global nonstop balloon record attempt.
- The McDonnell-Douglas DCX, Single Stage Rocket Technology (SSRT) 1/3 scale proof-of-concept demonstrator vehicle.
- Two Bell Helicopter Eagle Eye unmanned tilt-rotor aerial vehicle demonstrators.
- The VisionAire Business Jet demonstrator.
- Three NASA X-38 Crew Return Vehicles for subsonic flight testing.
- Nine 20 meter wind turbine blades for Zond.
- An all-new wing for the Israeli Aircraft Industries (IAI) Pioneer RPV, later renamed the Searcher.
- The all-composite main landing gear beam for the twin-engine IAI Hunter RPV.
- The primary and secondary structure for a General Motors (GM) technology demonstration vehicle, the GM Ultralite concept car.
- The Raptor high altitude UAV, developed for the NASA ERAST program.
- The POC VisionAire Vantage single engine business jet.
- The Williams International V-Jet II.
- The ROTON ATV SSTO Atmospheric Test Vehicle).
- The Proteus high-altitude long-endurance aircraft, developed for Wyman-Gordon, first flew in 1998, and set world's altitude records by flying over 63,000 feet. The aircraft has logged over 1500 hours, flying science missions to destinations including Europe, Japan and the North Pole.
- The Adam Model 309 POC aircraft, an all-composite, twin engine, centerline thrust aircraft. It is seeking FAA certification in 2005.
- Scaled's first project for manned space flight includes a new hybrid rocket engine, the White Knight (an airborne launch aircraft) and SpaceShipOne (a three-place, high-altitude research rocket). Sponsor for the program is Paul Allen. On 21 June 2004, with Mike Melvill at the controls, SS1 flew history's-first private manned space flight. On 4 Oct 2004, SS1 won the 10 M\$ X-prize (two flights within 5 days flown by Melvill and Brian Binnie).
- In 2004, Scaled performed the first flight of the second aircraft designed to fly non-refueled around the world. The Capricorn, built for Steve Fossett, was later named the GlobalFlyer, by sponsor Virgin Atlantic. The aircraft is expected to fly the solo record world flight in January 2005.

In June 1985, Scaled was sold to Beech Aircraft Corporation, acquired by Wyman-Gordon Company

in January 1989, and then sold to 10 private investors in September 2000 (Scaled Composites LLC). Mr. Rutan has been President/CEO since its formation in 1982.

#### **RAF - June 1974 to present:**

President of Rutan Aircraft Factory Inc. (RAF), a small business formed to develop light aircraft and market educational documents. Developed the VariViggen, VariEze, NASA AD-1, Quickie, Defiant, Long-EZ, Grizzly, scaled NGT Trainer, Solitaire, Catbird and the world-flight Voyager aircraft. Activities performed in the development of these aircraft covered the entire spectrum, from design through flight test, test report and documentation preparation, public relations and management of development facility. RAF provides builder support for over 3000 homebuilder customers. Homebuilt aircraft plans sales were discontinued in July 1985.

#### **OTHER EMPLOYMENT BY BURT RUTAN:**

March 1972 to May 1974: Director of the Bede Test Center, Bede Aircraft, Newton, Kansas. Directed development of three aircraft types including all flight and ground tests. Had design and development responsibility for the jet BD-J5 and trainer-simulator.

June 1965 to March 1972: US Air Force Government employee. Flight Test Project Engineer at the Air Force Flight Test Center, Edwards AFB. Conducted fifteen USAF flight test programs, ranging from large V/STOL cargo aircraft to several types of fighters.

#### **PILOT EXPERIENCE**

1. Began flying in 1959. General aviation pilot time in the following aircraft:

Beech T-34	Headwind
Beech Bonanza	Beech Model 76 (Duchess)
Beech Musketeer	Spirit of St. Louis Replica
Cessna 150, 172, 182, 210	Beech Travelair
Piper Cherokee 140, 180	Beech 58P pressurized Baron
Piper Arrow	B200 Super King Air
Piper J-3	B300 Super King Air
Piper PA18-150S Seaplane	VariViggen*
Aeronca Champ 7AC	VariEze*
Taylor L-2	VariEze POC*
American Yankee	Quickie*
American Traveler	Defiant*
Grumman Tiger AA5B	Long-EZ
Grumman Widgeon	Scaled NGT twin jet trainer
Ercoupe	Microstar twin jet VariViggen
Thorpe T-18	Beech 85% scale Starship
Luscombe 8A	M120 Predator
BD-4	CM-44 UAV
BD-5	Microlight Model 97
BD-5T	M133 ATTT assault transport prototype
BD-6	M81 Catbird

RF5-D	M143 Triumph cabin class twin turbofan
Ayers Thrush 600	T-34C
Piper Turbo Apache	Pitts S1
Robinson R22	Bell UH1D
Hughes 300	M151 ARES turbofan attack prototype
Hughes 500E	Enstrom F280
Robin ATL	Model 191
Model 202 Boomerang*	

\*Flew first flight of type and most of the research test program.

- USAF Co-pilot time in the following military aircraft, mostly during hazardous tests:

UH-IN	F-104A and B	C-130E
T-33	F-4B, C, E & Agile Eagle	C-141A
T-37	YA-26	F-106
T-38		

Total flying time 3000 hours. FAA ratings: Private, single engine land, multi-engine land, single engine sea, instrument airplane, single engine helicopter.

## MAJOR NON-PROPRIETARY PROJECTS DEVELOPED

MODEL	NAME	CUSTOMER	FIRST FLIGHT DATE	FABRICATION SHOP	DESCRIPTION
27	VariViggen	homebuilders	May 72	Rutan Aircraft Factory	canard pusher, 2-place, single engine, wood construction
31	VariEze Prototype	R&D	May 75	Rutan Aircraft Factory	high efficiency, loaded canard, all composite, Volkswagen engine
32	VariViggen SP	homebuilders	Jul 75	Rutan Aircraft Factory	Model 27 with added higher aspect ratio composite wings
33	VariEze	homebuilders	Mar 76	Rutan Aircraft Factory	homebuilt version of Model 31, larger, with aircraft engine
35	AD-1	NASA	Nov 79	Ames Industrial	skew wing, all composite twin turbojet
40	Defiant	homebuilders	Jun 78	Rutan Aircraft Factory	tandem wing, all composite, twin engine, four-place

54	Quickie	homebuilders	Nov 77	Rutan Aircraft Factory	single place, tandem wing, all composite, Onan engine
54	Quickie	homebuilders	Nov 77	Rutan Aircraft Factory	single place, tandem wing, all composite, Onan engine
61	Long-EZ	homebuilders	Jun 79	Rutan Aircraft Factory	high efficiency, long range, loaded canard, all composite, single engine
68	Biplane Racer	Mortensen/Amsoil	Aug 81	Customer	all composite, tandem wing for air racing in biplane class
72	Grizzly	R&D	Jan 82	Rutan Aircraft Factory	three surface, STOL, 4-place, all composite, for off-field operation
73	Next Generation Trainer	Fairchild Republic	Sep 81	Ames Industrial	subscale demonstrator to develop flying qualities for T-46 proposal
76	Voyager	Voyager Aircraft	Jun 84	Rutan Aircraft Factory	all graphite, optimized for long-range records, two pilot, twin engine
77	Solitaire	homebuilders	Jun 82	Rutan Aircraft Factory	self launching sail plane
--	PARLC	United States Navy	Sep 80	Ames Industrial	power augmented ram landing craft, twin turbojet
81	Catbird	R&D	Jan 88	RAF/Scaled	single engine turbocharged recip, 5-place pressurized 3 - surface configuration
97	Microlight	Lotus/Chapman	Jan 83	Scaled Composites	two-place, rigid ultralight pusher, canard, all composite
115	NGBA(Starship POC)	Beech Aircraft	Aug 83	Scaled Composites	variable geometry, twin turboprop, 85% scale of Starship design
120	Predator	Advanced Tech. Aircraft Corp.	Sep 84	Scaled Composites	all composite, agricultural application, 80 cubic foot hopper
133	ATTT	DARPA	Dec 87	Scaled Composites	twin turboprop assault transport, fast-acting flaps, 3-surface configuration
143	Triumph	Speculative	Jul 88	Scaled Composites	twin turbofan 7-place business aircraft, Williams FJ-44 engines
144	CM-44 UAV	California Microwave, Inc.	Mar 87	Scaled Composites	composite manned/unmanned, long endurance, canard,

					single pusher turbocharged engine
TRA 324	Scarab	Teledyne Ryan Aeronautical	Jun 86	Scaled Composites	ground launched high-performance reconnaissance drone, solid rocket + turbojet. Scaled conducted structure only development/production.
H1, H2	Wing Sail	Sail America	May 88	Scaled Composites	graphite wing sails for America's Cup Race, 90 and 108 ft span
--	Searcher	Israeli Aircraft Industries	Dec 88	Scaled Composites	long wing version of Pioneer RPV
151	ARES	Speculative	Feb 90	Scaled Composites	light attack turbofan, close air support aircraft, high agility, JT15D engine, GAU-12U gun
158	Pond Racer	Bob Pond	Mar 91	Scaled Composites	
173	TFV	Loral	Jul 89	Scaled Composites	towed vehicle for decoy - model tests
179	PLADS/Rockbox	Lockheed	Nov 89	Scaled Composites	eight man parachute delivery vehicle
--	Gondola	Earthwinds	Nov 91	Scaled Composites	pressurized gondola for world balloon flight
--	Pegasus flying surfaces	Orbital Sciences Corporation	Apr 90	Scaled Composites	air launch vehicle flying surfaces (wing, fins)
191	Model 191	Proprietary	Oct 91	Scaled Composites	single engine general aviation aircraft
--	B-2 RCS model	Northrop Corp.	--	Scaled Composites	40% scale pole model
--	SU25 1/4 scale ROAR	Sandia National Laboratories	Apr 91	Scaled Composites	rocket powered cable-mounted decoy
--	Ultralite show car	General Motors	Jan 92	Scaled Composites	4 passenger, 4 door show car for 1992
--	Eagle Eye	Bell Helicopter	--	Scaled Composites	tilt-rotor demonstrator aircraft
--	DC-X	McDonnell Douglas	--	Scaled Composites	30% scale single stage rocket technology aeroshell
202	Boomerang	IR&D	Jun 96	Rutan Designs	asymmetrical configuration 5-place pressurized reciprocating twin
226	Raptor D1	Department of Energy	Apr 93	Scaled Composites	high altitude RPV boost phase intercept
226	Raptor D-2 ERAST	DOE/NASA	Dec 94	Scaled Composites	high altitude RPV for environmental research

--	Vantage	Proprietary	Aug 93	Scaled Composites	FJ107 powered Long-EZ
--	Z-40 Bladerunner	Zond	Apr 94	Scaled Composites	blades for large wind generator
--	Comet	Space Industries	95	Scaled Composites	all composite spacecraft unmanned re-entry capsule
233	Freewing Full Scale	Freewing Aircraft	Oct 94	Scaled Composites	close range, super STOL RPV
--	Kistler Zero	Kistler Aerospace	--	Scaled Composites	two stage demonstration rocket - canceled mid '95
247	Vantage	VisionAire Corporation	Nov 96	Scaled Composites	single engine turbofan 7-place business aircraft with JT15D-5 engine
257	Motel 6 DLS	Voyager Aircraft	Jan 98	Scaled Composites	pressurized spherical gondola for manned world balloon flight
271	V-Jet II Spike	Williams, Intl.	Apr 97	Scaled Composites	twin turbofan 5 place pressurized
276	X-38 space station lifeboat	NASA	Mar 98	Scaled Composites	crew rescue vehicle for space station Three were built for Dryden & Johnson
281	Wyman-Gordon	Proteus	July 26, 1998	Scaled Composites	turbofan high flyer for telecom/recon/atmospheric science/space tourism
287	Alliance high flyer UAV	NASA ERAST		Scaled Composites	85,000 ft environmental research UAV R/C model tested to prove concept
302	TAA-1	Toyota Aircraft	May 31, 2002	Scaled Composites	4 place GA piston single
309	Adam Model 309	Adam Aircraft	Mar 00	Scaled Composites	twin turbocharged twin boom, push-pull 6 place business/personal aircraft
311	Capricorn GlobalFlyer	Steve Fossett Virgin Atlantic	Mar 5, 2004	Scaled Composites	Non-refueled, round-the-world range Single-pilot, turbofan. Fuel/GW = .82
316	SpaceShipOne	Mojave Aerospace Ventures	Aug. 7, 2003	Scaled Composites	three-place, high-altitude research rocket First private manned space flight 21Jun04
318	White Knight	Mojave Aerospace Ventures	Aug. 1, 2002	Scaled Composites	high-altitude, airborne launch aircraft
					UAV single turbo fan LO

326	Pegasus X-47A	Northrop Grumman	July 27, 2001	Scaled Composites	UAV for carrier suitability evaluation
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## PRESENTATIONS

1. AIAA Student Conference, 1965, "An Investigation of the Effect of Aileron Differential on Roll-Yaw Coupling During an Abrupt Aileron Roll." Project used an instrumented radio controlled model developed while in school.
2. Society of Experimental Test Pilots Symposium, 1967, "Development of a Heavyweight Low Level Aerial Delivery Capability."
3. Society of Experimental Test Pilots Symposium, 1970. "Fighter Testing - Spin Test or Spin Prevention Test?"
4. Canadian Aeronautics and Space Institute, Flight Test Certification Symposium, 1971, "Spin Testing for Certification -- Our Failures."
5. Society of Experimental Test Pilots Symposium, 1975. "Development Tests of a High Aspect Ratio, Canard-Type Light Plane."
6. Aviation/Space Writers Association 43rd Annual News Conference, 1981. "Challenge to General Aviation."
7. National Air and Space Museum Lindbergh Lecture, 1982. "Aircraft Design - A Blend of Science and Art."
8. Society of Experimental Test Pilots Symposium, 1984, "Use of the Proof-of-Concept Demonstrator for Aerodynamic Development."
9. Society of Experimental Test Pilots Symposium, 1987. "The Voyager Story."
10. California Polytechnic University at San Luis Obispo, Opening Ceremonies of Poly Royal, 22 Apr 87.
11. California Polytechnic University at San Luis Obispo, Commencement Address, 13 Jun 87.
12. Distinguished Lecture Series, WestPoint Academy, 17 February 1988.
13. Los Angeles Air Force Base, Space Division, "Acquisition Streamlining," 13 Oct 88.
14. AGARD Conference '88 at Edwards Air Force Base, "Low Cost POC Flight Testing," 19 Oct 88.
15. U.S. Department of Defense Acquisition Streamlining Conference, "R & D Acquisition, A System in Turmoil," 1 Jun 89.
16. National Academy of Sciences Rapid Prototyping Conference, "Prototype R & D - A Revolutionary Approach," 20 Jun 89.
17. National Research Council Committee on Ultralight Structures, "Fire the Concept Design Group," 14 Sep 89.
18. Leroy Randle Grumman Lecture Series, "Prototype R & D: A Revolutionary Approach," 4 Oct 89.
19. Defense Systems Management College, "Acquisition Streamlining," 21 May 90.
20. General Motors Design Center, "Rapid Prototyping," 22 May 90.
21. Paris Air Show for Dupont and Aerospatiale "Structural Seminar," 20 June 1991.
22. Eris Society, Aspen, CO - "Life, the Universe and Everything Else...," 5 Aug 92.
23. University of Kentucky Transportation Conference - Keynote Speaker "Future of Transportation," 29 Sep 92.
24. Society of Experimental Test Pilots Symposium, Beverly Hills, CA, "Flight Test Development

- of a New Generic Configuration -- The Boomerang," Sep 96
- 25. Georgia Institute of Technology, Harold W. Guggenheim Lecture Series on Innovation (second annual) - "Innovation: Use It or Lose It," Dec 96
- 26. More than 50 technical Presentations on the Voyager aircraft, "Small Team, Giant Challenge" 1987-Current.
- 27. Experimental Aircraft Association Convention, 1973 through current. More than 100 presentations on development of RAF aircraft and aerodynamics lectures.

## AWARDS

- 1. First Place National Student Undergraduate Award AIAA, 1965.
- 2. Air Medal (rare award for civilian), 1970.
- 3. Stan Dzik Design Contribution Trophy, 1972.
- 4. Omni Aviation Safety Trophy, 1973.
- 5. EAA Outstanding New Design, 1975, 1976 and 1978.
- 6. Dr. August Raspet Memorial Award, "Outstanding Contribution to the Advancement of Light Aircraft Design," 1976
- 7. Flying/Business and Commercial Aviation, 1978. Special Award "For a Lifetime Involvement in, Service to and Support of General Aviation."
- 8. Western Plastics Exposition, "Pacesetter Award," 1978.
- 9. Press Club of Antelope Valley, "Newsmaker of the Year," 1980.
- 10. Aviation Week and Space Technology magazine, Special Achievement - Laurels for 1981, for "Imaginative Ideas for Light, Energy-Efficient Aircraft Design."
- 11. Business and Commercial Aviation magazine, "Most Important Contribution to Aviation during 1984."
- 12. ABC World News Tonight, "Person of the Week," July 18, 1986.
- 13. American Institute of Aeronautics and Astronautics, Aircraft Design Certificate of Merit for initiative and creativity in the development of the Starship and Voyager aircraft, October 1986.
- 14. Presidential Citizen's Medal presented by Ronald Reagan, December 29, 1986 for Mr. Rutan's design/development of the Voyager 'round-the-world aircraft. This was the 18th award of the Presidential Citizen's Medal since its inception in 1969.
- 15. FAI Gold Medal for Voyager Construction, 29 Jan 87.
- 16. "Grand Medaille" de'Aero-Club de France, (Grand Medal of the Aero Club of France), January 29, 1987.
- 17. Medal of the City of Paris, January 29, 1987.
- 18. The Aero Club of Washington, 1986 Aviation Achievement Award, 24 February 1987.
- 19. NASA Langley Research Center, Directors Award, 24 Feb 87.
- 20. Society of Plastics Engineers, Award for Unique and Useful Plastic Product, (Voyager), 7 May 1987.
- 21. Society of Plastics Industry, Special Achievement Award for the Advancement of Composites for the Voyager Flight, 9 May 1987.
- 22. Society of NASA Flight Surgeons, W. Randolph Lovelace Award, 13 May 87.

23. Academy of Model Aeronautics, Distinguished Service Award, 15 May 1987.
24. National Aeronautic Association and the National Aviation Club, 1987 Collier Trophy for ingenious design and development of the Voyager and skillful execution of the first non-stop, non-refueled flight around the world, 15 May 1987.
25. Aero Club of New England, Voyager Award, 25 Jun 87.
26. American Academy of Achievement, Golden Plate to America's Captains of Achievement, 27 Jun 87.
27. Experimental Aircraft Association and Milwaukee School of Engineering, Medal of Outstanding Achievement and Distinguished Leadership in Aerospace Engineering, 4 Aug 87.
28. Daedalians of Edwards Air Force Base, Citation of Honor, 15 Aug 87.
29. Society of Experimental Test Pilots, 1987 J. H. Doolittle Award for outstanding professional accomplishment in aerospace technology management of engineering, September 1987.
30. Gathering of Eagles, Aviation Man of the Year, 17 Sep 87.
31. Charles Lindbergh Fund - San Diego Museum, Lindbergh Eagle Award, 24 Sep 87.
32. National Business Aircraft Association, Meritorious Service Award for 1987, 29 Sep 87.
33. United States Air Force Association, United States Air Force 40th Anniversary Award for Extraordinary Achievement, 1987.
34. The City of Genoa, Italy, Christopher Columbus International Communications Medal, 12 Oct 87.
35. Distinguished Achievement Award, International Aerospace Hall of Fame, San Diego, 7 Nov 87.
36. American Society of Mechanical Engineers, Spirit of St. Louis Medal, 16 Dec 87.
37. Royal Aeronautical Society, British Gold Medal for Aeronautics awarded for outstanding practical achievement leading to advancement in aeronautics for his original conception and successful design and development of the Voyager aircraft, December 1987.
38. The National Society of Professional Engineers, Outstanding Engineering Achievement in the NSPE 22nd Annual Outstanding Engineering Achievement Awards Competition, 27 Jan 1988.
39. Design News "Engineer of the Year for 1988," 8 March 1988.
40. Franklin Institute, Franklin Medal for 1987, 13 April 1988.
41. Intellectual Property Owners, Distinguished Inventor Award for 1987, 14 April 1988.
42. Western Reserve Aviation Hall of Fame, Meritorious Service Award, 2 Sep 1988.
43. The International Aerospace Hall of Fame Honoree, 24 Sep 1988.
44. Sailing World Magazine, Medal of Achievement, January 1989.
45. Aero Club of Northern California, Crystal Eagle Award, 18 Mar 1989.
46. Secretary of the Air Force Meritorious Civilian Service Medal for service on the USAF Scientific Advisory Board, April 1989.
47. Member of the National Academy of Engineering, 4 Oct 1989.
48. Leroy Randle Grumman Medal for outstanding scientific achievement 4 Oct 1989.
49. Structural Dynamics and Materials Award from American Institute of Aeronautics and Astronautics, presented "for innovative and outstanding contributions to the advancement of aerospace technologies, including the design, development and testing of light-weight, high performance composite structures materials," 14 April 1992.
50. Wings Over Houston Airshow Executive Committee, 1993 Lloyd P. Nolen Lifetime

'Achievement in Aviation Award, 16 Oct 1993.

51. Society for the Advancement of Materials and Process Engineering George Lubin Award, 9 May 1995.

52. National Aviation Hall of Fame Honoree, 21 July 1995.

53. "Freedom of Flight" award for "contributions to EAA and to aviation, especially for his leadership in the design of recreational aircraft--including Voyager--that have had an impact on the international aviation community", Experimental Aircraft Association, 3 August 1996.

54. College of Engineering Medallion "in recognition of extraordinary leadership and commitment in support of the Aeronautical Engineering Department," April 18, 1997, The College of Engineering at Cal Poly, San Luis Obispo

55. Chrysler Award for Innovation in Design, 1 October 1997

56. EAA Homebuilders Hall of Fame, 23 October 1998

57. Designer of the Year, Professional Pilot Magazine, 13 March 1999

58. Proteus Aircraft included in the list of the "100 Best of the Century", Time Magazine, April 1999

59. Clarence L. "Kelly" Johnson "Skunk Works" award by the Engineers Council "to honor and perpetuate Kelly Johnson's qualities, accomplishments, standards and model of excellence to be aspired to by future generations of engineers, pioneering progress of the future." February 2000

60. 2000 Lindbergh Award presented by the Lindbergh Foundation for a shared vision of a balance between technological advancement and environmental preservation. May 20, 2000.

61. The 2001 J.H. "Jud" Hall Composites Manufacturing Award presented by the Composites Manufacturing Association of the Society of Manufacturing Engineers for his "contribution to the composites manufacturing profession through leadership, technical developments, patents and/or educational activities", 22 Feb 2001

62. The Reed Aeronautics Award presented by the American Institute of Aeronautics and Astronautics "in recognition of significant contributions and achievements in the field of aeronautical sciences and engineering, as an engineer, designer and builder of aircraft that challenge conventional wisdom, thus opening the door for innovation in aircraft prototyping and stimulation of new ideas and applications to further aerospace endeavors, May 9, 2001.

63. Laurel Legend Award presented by Aviation Week & Space Technology. Received award and was inducted into the Aviation Week & Space Technology Hall of Fame, April 16, 2002.

64. "100 Stars of Aerospace" (ranked 29th) presented by Aviation Week & Space Technology. Received award in Paris at Salle Wagram, June 18, 2003.

65. "Business Leader in Aerospace" presented by Scientific American for designing a reusable sub-orbital passenger spacecraft. One of 50 individuals, teams or companies whose accomplishments in research, business or policy making during 2002-2003 demonstrate outstanding technological leadership, November 10, 2003.

66. Society of Experimental Test Pilots, "2004 J. H. Doolittle Award for outstanding professional accomplishment in aerospace technology management of engineering," September 2004. First to receive the Doolittle twice.

67. X Prize (Shared with Paul Allen). For repeated private manned space flights. 4 October 2004.

68. Wired Magazine's "Rave Award" for Industrial Designer Burt Rutan, 22 Feb. 2005.

69. Smithsonian's National Air and Space Museum's "Current Achievement Award", 9 March 2005

70. Aviation Week and Space Technology 2004 Laurel Award for Innovation/Entrepreneurship,

19 March 2005.

71. "Scientist of the Year" award by Achievement Rewards for College Scientists (ARCS), 15 April 2005.
72. Time Magazine's "100 Most Influential People in the World," 18 April 2005.
73. "2004 Robert J. Collier Trophy" - presented by National Aeronautic Administration, 19 April 2005. (This is the second Collier Trophy awarded to Mr. Rutan.)

## **PATENTS HELD**

1. Grizzly wide-chord flap suspension system, U.S. Patent Number 4,614,320.
2. Variable geometry high lift system incorporated in the Beech Starship, U.S. Patent Number 4,641,800. (Foreign patents also held.)
3. Rutan Model 115 Starship configuration, U.S. Patent Number Des. 292,393. (Foreign patents also held.)
4. U.S. Provisional Patent Application 60/458,296, filed March 28, 2003.
5. U.S. Provisional Patent Application 60/458,697, filed March 28, 2003.
6. Patent Cooperation Treaty Application PCT/US2004/009694, entitled "Unitized Hybrid Rocket System," filed March 29, 2004, claiming the benefit of the provisional patent application described in Item 4 above.
7. Patent Cooperation Treaty Application PCT/US2004/009695, entitled "Winged Spacecraft," filed March 29, 2004, claiming the benefit of the provisional patent application described in Item 5 above.

As of April 2005

[Canard Zone](#) > [Model Specifics](#) > [Long-EZ](#) > a 250 Knot Long EZ

PDA

[View Full Version : a 250 Knot Long EZ](#)

**airwrench**

04-2006, 05:27 PM

I am finishing up the initial stages of my long ez project. I have the bulkheads complete and waiting on the sticks for the fuse. I am interested in speed mods in an effort to achieve a moderately fast aircraft capable of withstanding cruising speeds in excess of 250kts. (the engine part is simple, I just want to know what structural mods would be prudent to implement in regards to the increased speed).....waited too long for the infinity, which don't seem to be getting off the ground:(

**Richard Riley**

03-08-2006, 12:07 AM

Yeah, the engine part is simple - just get an IO 540. Extend the fuselage a foot and move the pilot and passenger forward. Make the wingskins and spar caps out of carbon. Be sure to use a good pair of wheel pants and gear leg fairings.

**magnum**

03-08-2006, 03:29 PM

Newbie question here!

I am about to start my Long / Berkut project and am after basically the same thing. Speed! Could you also substitute the cozy wings and spar (since this is all new construction) and make the spar to the EZ dimensions and then carbon both? Would this change a lot or be more stabil in flight than the Long EZ wings?

Just curious (and now putting on fire suit):scared:

Press On  
Tom

**Spodman**

03-08-2006, 05:45 PM

Your questions are beyond my technical expertise, but I don't have a lot of faith in the above ideas either. I am not aware of any evidence there is anything deficient in the strength of the airframe or that this is the speed limiting factor. There are plenty of fast aircraft out there all fg. I am not convinced substituting cf for fg will (by itself) create a stronger structure.

I do understand the limiting factors are airframe flutter and performance of the canard. These problems may be overcome by redesign. Don't know how to go about it.

Remember this is a very efficient cross-country touring aircraft you are considering hot-rodding. On completion you will not have a particularly useful aircraft.

**satch**

03-08-2006, 08:28 PM

Yeah, the engine part is simple - just get an IO 540. Extend the fuselage a foot and move the pilot and passenger forward. Make the wingskins and spar caps out of carbon. Be sure to use a good pair of wheel pants and gear leg fairings.

Gee ... sounds like a Berkut FG :-)

**Jack Morrison**

03-08-2006, 11:54 PM

Add a little width, round the fuselage and bingo.

Jack  
E Racer 113

**airwrench**

03-09-2006, 04:39 PM

:D Add a little width, round the fuselage and bingo.

Jack  
E Racer 113 I Got that

**R.D."Rick" Talbot**

03-18-2006, 11:06 PM

I'm new to your organization but has anyone considered the Innodyn 255 hp turbine at 188 lbs instead of the IO-540 hp at 390 lbs ?

**Richard Riley**

03-18-2006, 11:11 PM

I'm new to your organization but has anyone considered the Innodyn 255 hp turbine at 188 lbs instead of the IO-540 hp at 390 lbs ?

I'll be happy to consider it when Innodyn delivers their first engine.

That would be sometime after the sun goes dark.

If you want to talk about a turbine engine that actually exists, we could talk about a 250 C-18. There's a guy that's just put one on a Cozy, with a custom gearbox. Very interesting. Or there's the Deltahawk, which has a good shot at delivering a batch of engines to it's first buyers, and might even be viable long term depending on the market in general.

Innodyn is vapor.

**R.D. "Rick" Talbot**

03-19-2006, 12:03 AM

Richard,

Thanks for the reply, I'll keep those engines in mind as I may convert my Long EZ to turbine some day, depending on cost.

**airwrench**

03-19-2006, 12:32 AM

I'll be happy to consider it when Innodyn delivers their first engine.

That would be sometime after the sun goes dark.

If you want to talk about a turbine engine that actually exists, we could talk about a 250 C-18. There's a guy that's just put one on a Cozy, with a custom gearbox. Very interesting. Or there's the Deltahawk, which has a good shot at delivering a batch of engines to it's first buyers, and might even be viable long term depending on the market in general.

Innodyn is vapor.

I am with you on that one, a lot of smoke from innodyne but not much else.

As far as efficient turboshaft engines are concerned-----heck, that deep in one might as well turbofan it!! Any way you go there will be considerable \$\$ to make it happen, but then again one could go with the 20B and throw on a couple turbos and "walla".....a seven hundred horse bomb.:scared:

**Richard Riley**

03-19-2006, 12:34 AM

Deltahawk's not a turbine, it's a diesel.

If you go looking to stuff a turbine in a Long EZ eventually someone will try to sell you on a converted APU (which is what the Innodyn prototype is). Don't do it.

**airwrench**

03-19-2006, 12:42 AM

Deltahawk's not a turbine, it's a diesel.

If you go looking to stuff a turbine in a Long EZ eventually someone will try to sell you on a converted APU (which is what the Innodyn prototype is). Don't do it.

Yes, I know deltahawk is a diesel....turbo/supercharged I do believe. It is supposed to run on a variety of fuels as well, I have followed them for a while and.....like cont./lyco.....they are genuinely expensive:envy:

**Steve\_Innova**

03-19-2006, 01:18 AM

Have you checked out the price of carbon fiber recently? I see quotes that it's "3 times the price of fiberglass". Ha, not even. There's a worldwide shortage of carbon fiber. Multiply by 10, at least.

**Richard Riley**

03-19-2006, 04:09 AM

Have you checked out the price of carbon fiber recently? I see quotes that it's "3 times the price of fiberglass". Ha, not even. There's a worldwide shortage of carbon fiber. Multiply by 10, at least.

Wow, is it that high? It's been about 4 years since I've bought any in quantity, I had no idea. I've been thinking it was in the range of \$25-35/yard - sounds like I'm out of date.

**Lifessamsara**

04-10-2006, 08:45 AM

Hi guys and girls,

Im new around these here parts :o but I have been lurking reading a number of posts.

The idea of a 250kt cruise speed is certainly a stretch target, but just the sort of things to get people thinking and their creative juices flowing. It would seem that most of us automatically start to think of the design innovations introduced with the Berkut a decade ago (carbon this, carbon that) and I suspect that is part of the solution..... but I do think it's going to take more than a lot of thrust (engine and prop' design), a slippery aircraft design (these canards are already slick), and reducing all the parasitic drag you can think of.

As Spodman correctly pointed out, the next big hurdle is most likely looking into the aerodynamic constraints (such as canard flutter). Like Spodman, Im not in a position to provide informed and precise aerodynamic consultancy services, but what about thinking in this direction..... what is the fastest (non-military) canard about? One of the larger commercial derivitives perhaps? What canard designs have they incorporated, and what is the relationship with it's primary wing (how does that compare to the standard Berkut/Longes design)?

I think threads like this may be just what get's some people interested in experimental aircraft..... experimenting. Now I know some of you are thinking this is a serious business, flying, and I totally agree (yes, aviation maintenance and engineering background here). This thread is about navel gazing, thinking of the 'if only' thoughts, and giving some direction to some dreaming going on out there.

I don't think that what everyone is seeking is a very efficient cross country touring aircraft, some people do like the hotrod (why do you think they chose to build Berkuts).

The Variez and Longez inspired many people and indeed their designs/modifications, just perhaps they have some more inspiration to provide.

I look forward to your replies, flames, but most importantly your thoughts about the 250kt Open-ez ;)

Cheers,

Bruce.

**karoliina**

04-10-2006, 11:54 AM

One thing to consider is:

- Canards have currently quite thick wing profiles.
- thick profile = more drag
- it is thick because of the strength required and it is achievable only with a thick profile if glass is used.
- with carbon it would be possible to use thinner profile
- with increasing intentionally the lift of the fuselage, maybe the wing span could be reduced a bit too.
- the Eppler 1230 mod is a thick turbulent profile and probaly quite draggy (haven't tried to simulate it or anything), a person like John Roncz would be capable of designing a new less draggy laminar profile for a replacement I am sure.

In a very draggy airplane, the wings create something like up to 60% of the drag of the airplane. Replacing the profile with a faster one, which would be better optimized for the higher cruise speed.

With the current profile, adding power does not help much. For example Cozy-Jet isn't very fast compared to how fast a jets usually are. If the drag of a profile increases exponentially above certain speed, you could be using a Saturn-V rocket engines and still be slow. I am quite convinced that making the plane faster, requires to change the wing profiles, in addition to making the fuselage etc. smooth. Small optimizations help a little, but new wings and canard could help significantly (IMHO).

**Richard Riley**

04-10-2006, 10:03 PM

Klaus is slowly building a new pair of wings for his Long EZ (not a typo, not talking about his Vari) with a different airfoil section and a smaller area. Also blended winglets. He says they won't be for sale.

**Lifessamsara**

04-10-2006, 10:59 PM

That's very interesting! Do you know if he is considering the inclusion of flaperons/flaps to accommodate TO and Landing speeds?

Do you know if he has any designs he wouldnt mind someone looking over?? :rolleyes:

**dpaton**

04-11-2006, 12:18 AM

I heard a nasty rumor that the cost to peek under the ultra-slick cowl of Klaus' Vari (and it's associated super low drag cooling system) was a firstborn son, indentured servitude sanding parts, and a left...er...leg, I doubt he'll let anyone short of Burt himself in on the details of his new wings.

Of course, being a nasty rumor, it might not be true.

:D

-dave

**Richard Riley**

04-11-2006, 02:58 AM

That's very interesting! Do you know if he is considering the inclusion of flaperons/flaps to accommodate TO and Landing speeds?

Do you know if he has any designs he wouldnt mind someone looking over?? :rolleyes:

I don't know if he's including flaperons, but I'd bet a lot of money against it.

If it were me, and I were willing to bet my life on untested wing mods (I'm not, I've got a little girl that I want to watch grow up) I'd look at Ilan Kroo's work on the C wing. I mean, if you really want a few extra knots that badly, there are worse things that you could bet your life on.

**Lifessamsara**

04-12-2006, 10:18 AM

I'd look at Ilan Kroo's work on the C wing. I mean, if you really want a few extra knots that badly, there are worse things that you could bet your life on.

Any idea how I could find out more about Ilan Kroo's C wing?

Bruce.

**Richard Riley**

04-12-2006, 11:04 AM

<http://aero.stanford.edu/reports/nonplanarwings/nonplanarwings.html>

**Wayne Hicks**

04-12-2006, 01:47 PM

"Cozy-Jet isn't very fast compared to how fast a jets usually are. "

----> Greg won't exceed the published Vne because of control surface flutter. So, he can't utilize all that power yet. He is working with the EZ jet folks and is building new elevators and ailerons. I haven't spoken to Greg in a while, but I heard rumors of new carbon wings and canard too? Anyway, he expects the new "airframe" will have a higher Vne that will allow him to put to use some of that excess power the engine is capable of generating. He's gonna go ALOT faster.

**RGlos**

04-13-2006, 10:06 AM

Ha

I have the standard original GU Canard. If I could push mine up to 250 Kts. I'd have to remount the canard incidence to -20 degrees just to keep the nose down. As it is I have to hold down presure on the stick at + 170 kts and that's in a dive.

The only good thing a 600 hp LEZ could do would be STO. I removed the landing "L" part of this formula as it would not shorten the landing.

Remember the faster you go, you have to have some way to get rid of lift on the canard. The same basic principles would apply to a 600 hp Piper Cub.

My 2 cents

**airwrench**

04-13-2006, 05:25 PM

Yes, hanging in the breeze at 250kt plus is what we are looking to approach here. The thin wings will help, maybe a swept (mildly) canard? Or, one which mechanically sweeps forward and back?:scared:

**Lifessamsara**

04-14-2006, 02:17 AM

Could someone explain the design concept of the swing-wing canard on the Beech Starship? Apart from being speed related, what was the primary relationship with the aerodynamic function of the canard? A link to a suitable site that explains this would also be of benefit thanks. :)

**Jon Matcho**

04-14-2006, 11:13 AM

Could someone explain the design concept of the swing-wing canard on the Beech Starship? Apart from being speed related, what was the primary relationship with the aerodynamic function of the canard? I \*think\* it sweeps forward during take offs and

landings to achieve a lower stall speed. It sweeps back for higher speeds in flight.

A link to a suitable site that explains this would also be of benefit thanks. :)www.google.com :)

OR... visit www.uspto.gov and locate Burt Rutan's patent on this particular design. There should be drawings and a complete explanation there.

**Marc Zeitlin**

04-14-2006, 11:24 AM

Could someone explain the design concept of the swing-wing canard on the Beech Starship? I'll bet someone could. Apart from being speed related, what was the primary relationship with the aerodynamic function of the canard?

To meet the FAR landing speed requirements, the Starship required flaps on the main wing. Flaps substantially change the moment coefficient of the wing, and to counteract the extra nose down moment of the main wing, the canard needed to be further forward. The swinging forward of the canard was coupled to the flaps on the main wing - when the flaps were deployed, the canard swung forward, moving the center of lift of the canard forward. This kept the lift/moment balance of the aircraft correct.

It's not "speed" related - it's flaps related. Now, you only deploy flaps at relatively low speed, but no matter what the speed, if the flaps weren't deployed, the canard doesn't move.

The mechanism is extremely complex.

The patent # is 4,641,800.

Interestingly enough, while poking through the patents, a derivative patent for a SLIDING canard is presented by a "John A. Lockheed", in 1989, that uses a COZY III as the basis for the figures. The figures are reasonably explicit as to the workings. Whether this aircraft was ever built, I have no clue - I've never heard of it or seen it. The patent # is 4,848,700.

**Lifessamsara**

04-15-2006, 01:33 AM

Well Marc, thanks for that, it certainly made interesting reading (along with some of the other concepts in the Patents in the same area).

It would seem if a canard used a swing canard configuration along with a flap it would provide a suitable TO/landing performance, and provide a lesser drag profile for higher speed cruise (less drag as Carolina pointed out).

I wonder, does this seem to be indicating the 250kt OpenEZ design brief?

What kind of flap design could be used on an OpenEZ plan?

I'm enjoying the open thinking in this thread so far, and hope it continues.

Cheers,

Bruce.

**Marc Zeitlin**

04-15-2006, 03:37 PM

It would seem if a canard used a swing canard configuration along with a flap it would provide a suitable TO/landing performance. Since canards already have "suitable" TO/Landing performance, the addition in weight and complexity of moving the whole canard airfoil is completely unwarranted. It's on thing to take on the complexity in a 6-8 seat bizjet - it's quite another in a 4 seat (or 2 seat) GA aircraft. It's why you don't see multi-surface fowler flaps on GA aircraft, either.

and provide a lesser drag profile for higher speed cruise (less drag as Carolina pointed out). If there were any truth to Karolina's statements about drag, then it might be worth thinking about. However, her suppositions about drag and airfoil shapes, with respect to L.E.'s and COZY's are incorrect. Witness the many canard aircraft (Berkut, supercharged E-Racer, souped up V.E.) that can fly well into the high 200 - 275 Kt. range with the stock airfoils. It's not the thickness of the airfoils that's creating any issues here.

I wonder, does this seem to be indicating the 250kt OpenEZ design brief?

What kind of flap design could be used on an OpenEZ plan? I'm not sure what your first sentence means. Personally, I wouldn't even think of adding flaps, and the concomitant complexity of canard rotation/sliding to my aircraft - the reduction in reliability alone would make it a non-starter. I can land and stop in less than 2000 ft, normally - 3000 when at gross weight and forward CG. There are almost no airports that I want to go to that I can't get in and out of.

If I wanted to go faster, I'd concentrate on intersection drag of the gear, cooling drag, and I'd turbocharge my engine. Leave the airfoils out of it.

**Jon Matcho**

04-18-2006, 11:24 AM

If there were any truth to Karolina's statements about drag, then it might be worth thinking about. However, her suppositions about drag and airfoil shapes, with respect to L.E.'s and COZY's are incorrect. Karolina has a valid point: airfoils CAN be replaced to achieve less drag. Klaus Savier apparently believes this to be the case (I'm sure he's not doing it for 'looks').

Witness the many canard aircraft (Berkut, supercharged E-Racer, souped up V.E.) that can fly well into the high 200 - 275 Kt. range with the stock airfoils. It's not the thickness of the airfoils that's creating any issues here. I'm not familiar with the "souped up V.E.", but the others performers you mention (those that can get 250kts?) are powered with Lycoming 540s. Your point is valid of course -- a carbon-skinned Berkut will indeed go fast.

If I wanted to go faster, I'd concentrate on intersection drag of the gear, cooling drag, and I'd turbocharge my engine. Leave the airfoils out of it. What else? How about the intersection of the strakes to the fuselage (upper and lower)? Can that be improved? What about the winglet-wing intersection the Cozy Girrls did (check out 'Current Status' on their Web page (<http://www.cozygirrls.com/menupage.htm>))?

**Marc Zeitlin**

04-18-2006, 01:09 PM

Karollina has a valid point: airfoils CAN be replaced to achieve less drag. Klaus Savier apparently believes this to be the case (I'm sure he's not doing it for 'looks'). Klaus is trying to get the last few knots out of an airplane that has already had everything even remotely easy done to it (assuming he's doing to the L.E. what he's already done to his V.E.). Karollina's point about canard thickness being a substantial portion of the drag of the aircraft is just wrong. Go look at drag polars of various airfoils appropriate for canards, find the minimum Cd, and then think about how many pounds of drag dropping that Cd will eliminate. Then consider that a reason to change the airfoil of the canard would be to eliminate the propensity for Mach Tuck at the high speeds that Klaus is trying to achieve.

There may very well be airfoils out there that would have better Cd's at the Cl's used for the canard, but the thickness is not the major issue. That's what I was directing my comments to, along with the comment that fuselage lift could replace wing lift. Since wings are far more efficient (Cl/Cd) lifting surfaces than fuselages, that's the last thing you'd want to do. Plus, thin airfoils have terrible stall characteristics - not optimal for a canard aircraft.

Take a look at:

[http://www.mh-aerotools.de/company/paper\\_3/yaka.html](http://www.mh-aerotools.de/company/paper_3/yaka.html)

You can see that the minimum Cd for all the airfoils listed (with smooth surfaces) is about 0.005, in the range of Cl's we're talking about. You're not going to substantially reduce that (at low Cl's) by changing airfoils. A look at Appendix IV of "Theory of Wing Sections" shows that almost all minimum Cd's are in the range of 0.004 to 0.006, with the lower "drag buckets" coming only in a very small range of Cl's (with thin sections). You might change OTHER characteristics by going to a thinner airfoil, but not the minimum drag coefficient, at least not substantially. This implies that changing canard airfoils will not have a large effect on top speed (from a drag standpoint).

I'm not familiar with the "souped up V.E.", but the others performers you mention (those that can get 250kts?) are powered with Lycoming 540s. Your point is valid of course -- a carbon-skinned Berkut will indeed go fast. I was referring to Klaus's aircraft. His O-200 puts out substantially more than 100 HP.

What else? How about the intersection of the strakes to the fuselage (upper and lower)? Can that be improved? What about the winglet-wing intersection the Cozy Girrls did (check out 'Current Status' on their Web page (<http://www.cozygirrls.com/menupage.htm>))? Everything can be improved. The things I listed are the main ones, and will get you many knots relatively simply. The things you list are second order effects - optimizing them MIGHT get you a few knots, but it's hard to say.

**Jon Matcho**

04-18-2006, 05:39 PM

Then consider that a reason to change the airfoil of the canard would be to eliminate the propensity for Mach Tuck at the high speeds that Klaus is trying to achieve. That's a joke right? I hope so... because I think I just got it!

That's what I was directing my comments to, along with the comment that fuselage lift could replace wing lift. Since wings are far more efficient (Cl/Cd) lifting surfaces than fuselages, that's the last thing you'd want to do. I agree, for other reasons, namely the complexity as indicated by the reference material you're citing.

Still, what about a more spherical nose shape that's better blended into the body from the canard forward? Everyone wants to put on supersonic nose cones, but the perfect subsonic shape is a rain drop (cone w/sphere at end). I've been thinking about designing this new nose using CAD, and taking cross sections for the bulkheads needed to form the "improved" shape. What do you think, worthwhile? 10 knots or 0.1kts?

**Marc Zeitlin**

04-18-2006, 06:49 PM

That's a joke right? I hope so... because I think I just got it! Well, you'll have to explain it to me, because I'm not sure what you "got" - there was no joke....

Still, what about a more spherical nose shape that's better blended into the body from the canard forward?.... What do you think, worthwhile? 10 knots or 0.1kts? A lot closer to the latter than the former. It's not like folks with the long nose L.E.'s are seeing any speed decreases....

**Jon Matcho**

04-18-2006, 09:33 PM

Well, you'll have to explain it to me, because I'm not sure what you "got" - there was no joke....I thought 'mach tuck' was a phenomena that occurred as an aircraft approached the speed of sound (~mach 0.85?). If that's the case, I don't understand how 'mach tuck' is anything anyone in a canard will have to worry about. Then again, I suppose the jets and rockets could get that fast if they tried.

What am I missing? What's 'mach tuck' have to do with Klaus?

**Marc Zeitlin**

04-18-2006, 10:38 PM

I thought 'mach tuck' was a phenomena that occurred as an aircraft approached the speed of sound (~mach 0.85?). If that's the case, I don't understand how 'mach tuck' is anything anyone in a canard will have to worry about. Then again, I suppose the jets and rockets could get that fast if they tried.

What am I missing? What's 'mach tuck' have to do with Klaus? You must have missed the multitudinous discussions of Mach Tuck on both the mailing list(s) and the fora. The Roncz canard is theorized to have a critical Mach # of about 0.55 - 0.75. At high altitudes, with a turbocharged engine, canards can approach that. That was my reference - to go a LOT faster in one of our aircraft, the canard airfoil would have to be changed in order to avoid this phenomena.

Read the thread:

<http://canardaviationforum.dmt.net/showthread.php?t=2085>

Especially Richard Riley's last sentence in his last post.

**Jon Matcho**

04-18-2006, 11:36 PM

You must have missed the multitudinous discussions of Mach Tuck on both the mailing list(s) and the fora. I do recall the discussions, and a visit to the link you provided reminded me of what I thought then -- that the issue is likely (and hopefully) going to have nothing to do with my airplane.

Thanks for the education Marc.

**7480W**

04-19-2006, 03:19 AM

Has anyone considered the possibility of sweeping the main wings more to reduce drag. I know that with this the twist would have to be increased in order to not stall tips first. Maybe I'm being crazy here. One possibility with too much money and time the possibility of movable wings, so it could remain the same landing and low speed flight. If the wings were swept back far enough it could almost be a delta style wing. I know some very different principals, but it could help with the mach number problem, I was told that a greater swept wing with the same airfoil has a higher mach # usage. Though not from the most reliable source. I think that the canard would have to be different as well to stop it from being the limiting factor. I think this will get really complex really quickly but, Just a thought. Thank You all for being so helpful as well all the great advice in this thread.

**AP3\_C**

04-19-2006, 04:47 AM

"Mach Tuck"

From the little info I have I understand that the occurrence of Mach Tuck is given to the situation where the Centre of Pressure transfers from the (approx) forward third of the wing section in normal flight to the rear third (approx) of the wing section as the aerofoil approaches and passes through the speed of sound thus causing the aircraft to pitch down.

Others out there may have a better explanation but I cannot see how aircraft like the LE and a like would suffer from a situation like this as the speeds required to fly at would be well exhilarating to say the least. :D

Jamie

**AP3\_C**

04-19-2006, 04:58 AM

Did a bit more reading and I can see how maybe the LE type aircraft can have critical Mach number issues.

Critical Mach number - speed at which the aircraft is flying to have air flow on airfoil accelerated to the speed of sound. Thus possible Mach Tuck issues.

Jamie

**Lifessamsara**

04-19-2006, 05:46 AM

Well guys, I am gladly receiving quite an education through this thread, so thankyou.

Marc, I can see that the current airfoil for the main wing may be suitable for a cruise speed of 250kts (as that was the original concept of this thread), and that you are indicating addressing the the design of the fuselage to reduce drag may be the best way to produce an economical high speed cruise.

I'd be interested to know what your thoughts are about improved performance of the nose, canopy and width/height of the fuselage are Marc. I for one do not need to widen a cockpit 2-4" just yet (that middle age spread has not kicked in just yet ;)) I'm also interested in the discussion on the vortex generation drag performance associated with our winglet wings. Is there a way to also reduce drag here?

Let's not forget what Mike Arnold achieved with just 65hp.... 213mph. Some guys have been dropping 220hp in the back of their canards..... why can't a 300kt top speed and 250kt possible with a basically slippery design and all that power be achieved?

Keep up the open and creative thinking guys, and the technical discussion of the realitive merits of each idea (and leverage off that thinking).

I look forward to the future posts.

Cheers,

Bruce.

**karoliina**

04-19-2006, 06:27 AM

shapes, with respect to L.E.'s and COZY's are incorrect. Witness the many canard aircraft (Berkut, supercharged E-Racer, souped up V.E.) that can fly well into the high 200 - 275 Kt. range with the stock airfoils. It's not the thickness of the airfoils that's creating any issues here.

I made that assumption based on the fact that Greg Richter does not go faster than 200-240 kt with his Cozy-Jet according to the article. That is not very much considering that there is a lot of more power available in the jet engine than there is in a piston engine (no matter what horse power) at the same altitude. I may be also incorrect with the assumption, but to me it sounded like the drag starts to rise exponentially above the normal speed range of the canards because the airfoils are not designed for a such speed range. As a matter of fact on the other hand, I am not aware to which speed range the airfoils of Cozy are designed to and would appreciate if somebody with more knowledge would enlighten me.

Best Wishes,  
Karoliina

**Marc Zeitlin**

04-19-2006, 11:54 AM

I made that assumption based on the fact that Greg Richter does not go faster than 200-240 kt with his Cozy-Jet according to the article. "Does Not" and "Can Not" are two different things. Greg has explicitly said that his aircraft COULD go a LOT faster, but he limits the speed because the Vne of the COZY is 220 mph IAS, so he doesn't go faster than that.

... I may be also incorrect with the assumption, but to me it sounded like the drag starts to rise exponentially above the normal speed range of the canards because the airfoils are not designed for a such speed range. And yet Jack Morrison's E-Racer has gone ~300 mph, as have some Berkuts, and Klaus's V.E. is in the 250 mph range. Drag does rise, and the aircraft are not designed for those speeds, but they can achieve them with a lot of power and judicious drag reduction. Greg's jet could EASILY beat those #'s, if he was willing to exceed Vne.

As a matter of fact on the other hand, I am not aware to which speed range the airfoils of Cozy are designed to and would appreciate if somebody with more knowledge would enlighten me. As Richard Riley has pointed out, the Critical Mach # of the canard is somewhere between .55 and .75, and the main wing may not be far different. This gives an upper limit for TAS. Without the drag polars, we can estimate a Cd of 0.005 for each wing at low AOA's and get an approximate speed/power curve. It's pretty obvious (since it's been done) that 300 mph is achievable with enough power, and "enough" is defined as somewhere in the 300 HP range.

Let's not forget what Mike Arnold achieved with just 65hp.... 213mph. Let's not forget that that's a tiny 1 seater. A very efficient one, no doubt, but tiny.

Some guys have been dropping 220hp in the back of their canards..... why can't a 300kt top speed and 250kt possible with a basically slippery design and all that power be achieved? It IS possible, and it's been done. I've said so many times, and others have proved it. The question is not CAN it be done, but how close to the edge are we when doing it?

**Len Evansic**

04-19-2006, 02:48 PM

I can't speak for Greg, but he has indicated to me that the CozyJet is a bit of an R&D mule. He's still tinkering with it, and still expanding the envelope. The CozyJet is itself not an end, but a beginning of his next project where he wants to tackle the Vne issues with stiffer wing structure and some other changes. As much as he is experimenting with the design, he is trying to do so in a cautious manner.

-- Len

**Jack Morrison**

04-19-2006, 11:12 PM

Mark is exactly correct on this issue. I have been there and let me tell you 300 mph is extremely fast for these canard AC. No one really knows where that edge is, and I would be verly reluctant to push past what has already been accomplished . If mach tuck occured at these speeds, there is no recovery and your last ride would wind up being a slow ride in a hearse. I am not a young person in age, but I plan to be around for quite a while

Jack Morrison

**longez360**

04-20-2006, 07:12 AM

That is one heck of a nice E-Racer you have Jack. I managed to battle though a crowd and see it at OSH. What sort of performance (TAS) are you seeing at altitude?

Cheers,

Wayne Blackler  
IO-360 Long EZ VH-WEZ  
Melbourne, AUSTRALIA

**Jack Morrison**

04-21-2006, 12:51 AM

Wayne

Last year I saw 253kt T . at 10,000 2980 rpm- 43in MP . That was turning a catto 3 blade 66/103. Im sure there was more left but I have been fighting cht gremlins for 5 years on this AC and I could not hold any HP down for over a minute or two. Estimated 360 hp is not easy to cool. I have changed my cooling system 6 times in the last 5 years and have tried about every alteration possible to improve each system with only limited success. That is until today about 41/2 hours ago. With the new(7) designed plenums I got the near perfect differential numbers I was looking for and the cooling was great. I still have not tested my new prop, a catto 64/113. I will post the results in the next few months. I am going to disassemble the Ac this weekend and strip all the paint off and do a repaint, (same colours)I should loose about 100+ lbs. Lousy job but I will enter the cup race this year and need to loose some weight. If all works out as planned, I should do well in the race, only problem I have to run in unlimited. By the way, that longEZ of your 's is georgous. You have done a great job on your EZ. Good luck down under.

Jack

**Jon Matcho**

04-21-2006, 09:37 PM

Jack... it's great to hear you've got your cooling working. That had to be driving you nearly insane.

I'll be looking forward to seeing some pics, or looking things over in the future.

**Jack Morrison**

04-21-2006, 11:29 PM

Thanks Jon

I guess persistance and dedication do rule. One of these days soon, when I finally get back together, I'll take you for a ride, its impressive. I'll send some photos of the new cowlings when the painting is completed. They netted me + 8 kts.

Jack

**Lifessamsara**

04-22-2006, 12:28 AM

Hi Jack,

Im sure we are all very interested to benefit from your knowledge and ideas of what aspects of canard design contribute to real gains in aerodynamic efficiency.

Do you have a website for your aircraft and your endeavours?

You mentioned that you gained 8kts from your mod's to your cowlings, what other mod's have revealed benefits?

Thanks for sharing your experience.

Bruce.

**longez360**

04-24-2006, 03:25 AM

Jack,

Congratulations on the cooling success. 5 years of experimentation must have been damned frustrating. Appreciate the reply. Will get back to you for some pictures once you have it all repainted.

Cheers,

Wayne

**Jack Morrison**

04-28-2006, 10:49 PM

Thanks Wayne/Bruce from down under.

Tomorrow I will disassemble the AC, strip off the old paint and redo. It will be interesting to see how much weight I save. I will keep every one posted with the before and after weights. I am looking for 100 to 130 lbs reduction. If that is correct, I will be able to loose another 30 lbs in the nose ballast, because most of the weight is aft CG weight. That could possibly net me 150-160 lbs weight. I only weigh 165. Should take about 3-4 weeks.

Jack

**Jon Matcho**

04-29-2006, 07:27 PM

Jack, why not consider a new and improved paint scheme while you're at it? Not that there was ANYTHING wrong with the current scheme.

Also, what's the technique for stripping paint off of a composite aircraft?

**Jack Morrison**

04-29-2006, 09:49 PM

Lon

I have experimented with at least 10-15- different designs and colors and I keep returning to the original scheme. There will be a new take-off on the flames but otherwise it will be the same. What can I say. About the striping of the paint, I talked with two people who do soda blasting and I am not comfortable with the process. I had one of the companies trial test my old lower cowling and it was terrible. So, today I removed the left wing and sanded it and the left strake to the primer, block sanded it and will reprime it tomorrow and block it a second time. I suspect it will take me at least 3 weeks to finish the repaint. The sanding is going faster than I would have expected but it sure is messy. I weighed the wing before striping and will weigh it when completely stripped. I started with 36 grit-to 80 grit-to 150 grit and reprimed. then 320 for final sand and then seal. Always block sand all coats. I'll let you know how much weight I saved.

Jack

**athomp58**

04-30-2006, 12:19 AM

Jack,  
What brand paint do you plan to use? Is it an acrylic urethane? Do you think clear coating it would reduce drag?

Aubrey

**Richard Riley**

04-30-2006, 01:51 AM

Lon

I have experimented with at least 10-15- different designs and colors and I keep returning to the original scheme. There will be a new take-off on the flames but otherwise it will be the same.

Are there any pictures of it on the web?

**Jack Morrison**

04-30-2006, 07:47 PM

Richard

Not yet but it will be different. I'll send some photos when I have completed the painting. I am trying to use the BASF extreme rainbow colors in the flames. For all interested, I am using PPG base/clear coat paint and have painted several AC with this product and am very satisfied with the results. It is no way the least expensive product but I have been using PPG products for over 45 years and have found them to be excellent in quality, performance and application.

Jack

**Jack Morrison**

05-13-2006, 01:08 AM

OK

I removed both wings and weighed the left wing, with all control surfaces attached, wiring for lighting and nav/strobe lights and weighed 93 lbs. I originally put on 5 coats of acrylic laq. paint, did not like the results, sanded down, recoated with sealer, base coat stripes, and 3 high build PPG 2042 clear coat, sanded and buffed. Over the next 8 years painted the AC 3 more times the same way. I sanded the paint off to the substrate, bubbles, and reweighed the wing. I could hardly believe the results. Total difference was 10 lbs. I went to the paint store and weighed the product less the cans at 96.5 lbs to paint the total AC one time. I estimate that one wing is about 1/4 the paint applied, so that would be about 24 lbs applied and actual weight on the AC would be about 3 lbs per paint job. At this point, I would estimate that the total weight for painting this type AC, And I am talking primer, sealer, base coat, stripes, and 3 clear coat does not weigh more than 15 lbs at the most. I have painted all my life and had no idea on how much waste there was in the application of paint, there was no reason until now. I will not know the final weight savings until reassemble and do a final weight and balance. I painted a Lancair about 5 years ago and after talking to him last week, he said that he did a weight and balance before paint and without upholstery, and weighed in after painting and upholstery at 41 lbs more. Ruined my day. So I wouldn't be worried about putting a nice paint job on your AC, the weight penalty will not hurt you. One good note, 50% of the weight is in the wings which are way behind CG and I was able to remove 25 lbs of ballast from my nose. I'll post again when I have completed the project, hopefully by the end of the month.

Jack

**airwrench**

05-14-2006, 05:13 PM

anytime you get to toss ballast overboard you gain at every level, and it is always nice to be able to carry a little extra fuel on those long---ain't got time to stop trips!

**Jack Morrison**

05-20-2006, 08:46 PM

I agree 100%. With 360 HP, it does not help a great deal. I have installed an adjustable wastegate on my intake side to try to improve MPG. I'll let everyone know how effective it is after all my testing is complete. This stripping project is a pain in the butt.

Jack

**airwrench**

05-20-2006, 10:59 PM

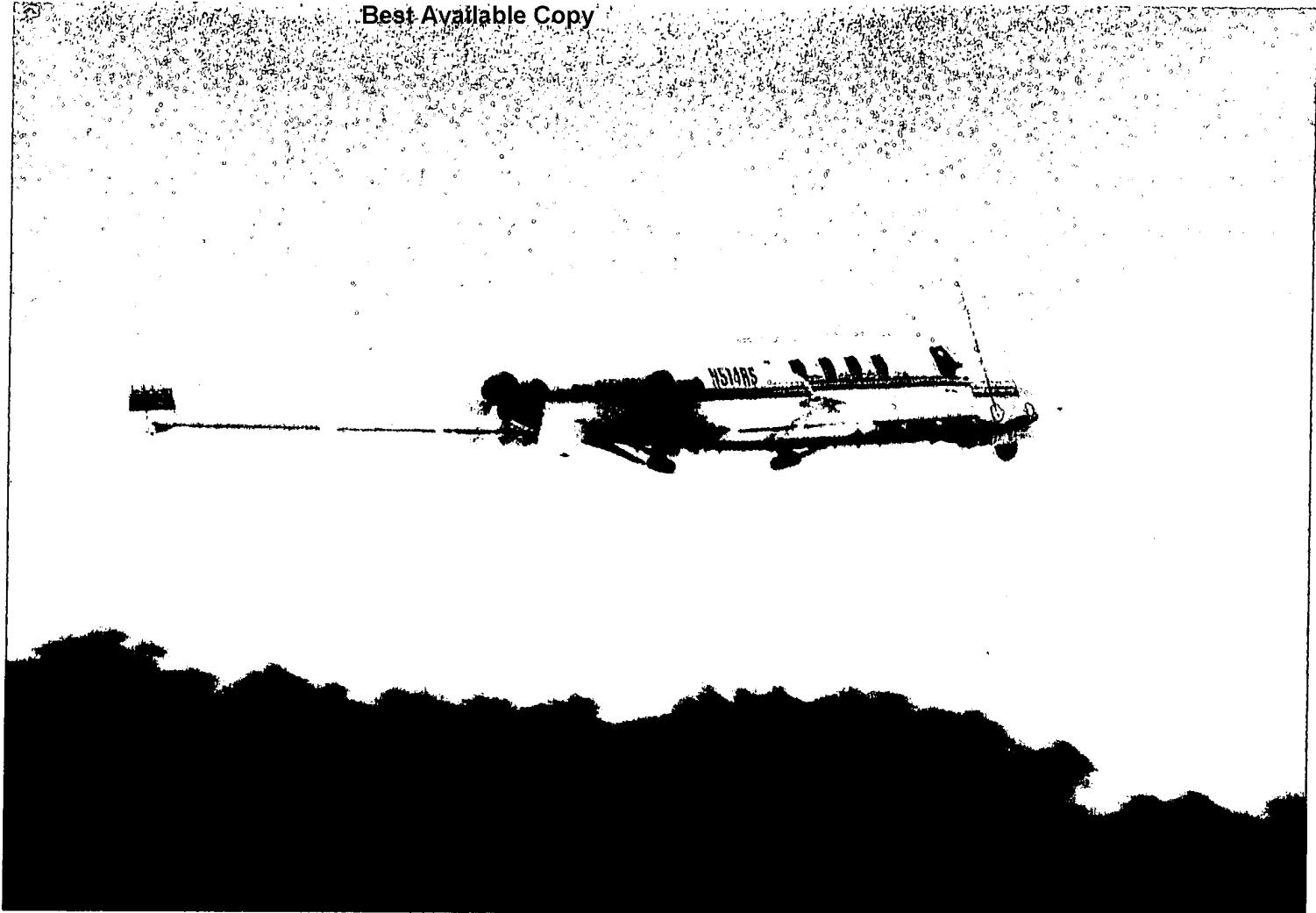
I agree 100%. With 360 HP, it does not help a great deal. I have installed an adjustable wastegate on my intake side to try to improve MPG. I'll let everyone know how effective it is after all my testing is complete. This stripping project is a pain in the butt.

Jack

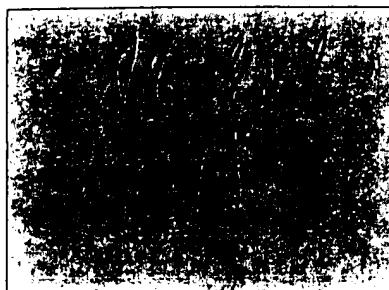
MPG numbers are nice when you are not trying to go around the pack. You know, those times when you fall out of altitude and drop in for a little sight seeing, 15+ gph just gets into the pocketbook a little more than comfort allows. I am building a 13B, using a T-4 turbo and the stock injection system. I will probably bump high horsepower for a moment, til the temps tell me to back out of it!!!!!!! I thought for a long time about putting a IO540 in my ez but, getting good fuel numbers is hard. My goal is to have good long range and acceptable cruise performance.....hope to hang around 200 kts while still staying in the ballpark on the fuel usage. If I had 360hp in the back, lookout!!!!!!! Enjoy the paintwork:)

**Attachment 4**

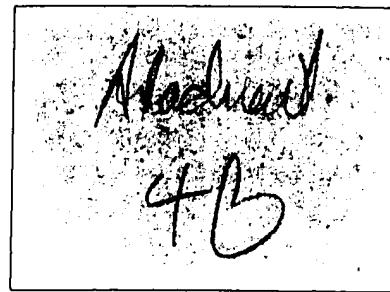
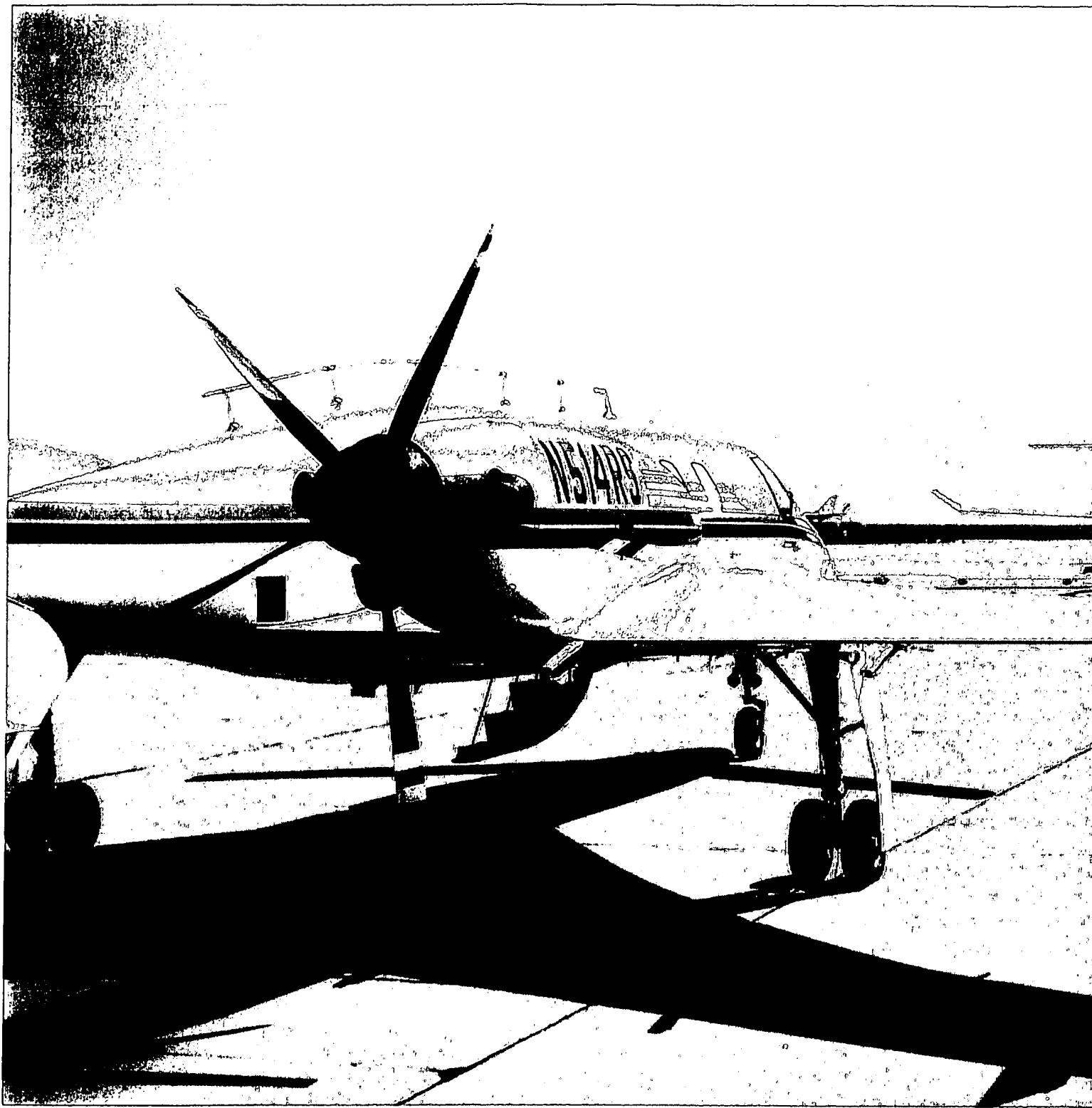
**Submitted in Response filed March 18, 2009  
to Office Action mailed February 18, 2009,  
“Entered” by the Examiner’s Subsequent Office Action of July 13, 2009**



Entangled pictures from  
attachment of 3 B







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 FAA Registry  
 N-Number Inquiry Results
 

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N514RS is Assigned

## Aircraft Description

<b>Serial Number</b>	NC-51	<b>Type Registration</b>	Individual
<b>Manufacturer Name</b>	BEECH	<b>Certificate Issue Date</b>	07/03/2007
<b>Model</b>	2000	<b>Status</b>	Valid
<b>Type Aircraft</b>	Fixed Wing Multi-Engine	<b>Type Engine</b>	Turbo-Prop
<b>Pending Number Change</b>	None	<b>Dealer</b>	No
<b>Date Change Authorized</b>	None	<b>Mode S Code</b>	51470723
<b>MFR Year</b>	1994	<b>Fractional Owner</b>	NO

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## Registered Owner

<b>Name</b>	SCHERER ROBERT P TRUSTEE			
<b>Street</b>	861 PRODUCTION PL STE A			
<b>City</b>	NEWPORT BEACH	<b>State</b>	CALIFORNIA	<b>Zip Code</b>
<b>County</b>	ORANGE	92663-2861		
<b>Country</b>	UNITED STATES			

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## Airworthiness

<b>Engine Manufacturer</b>	P&W	<b>Classification Standard</b>
<b>Engine Model</b>	PT6A SER	<b>Category</b>

**A/W Date** 09/13/1994

This is the most current Airworthiness Certificate data, however, it may not reflect the current aircraft configuration.

For that information, see the aircraft record. A copy can be obtained at

<Http://162.58.35.241/e.gov/ND/airrecordsND.asp>

## Other Owner Names

None

**United States Patent** [19]  
**Rutan**

[11] **Patent Number:** Des. 292,393  
[45] **Date of Patent:** \*\* Oct. 20, 1987

[54] **AIRPLANE**

[76] **Inventor:** Elbert L. Rutan, Hangar 73 Mojave Airport, Mojave, Calif. 93501

[\*\*] **Term:** 14 Years

[21] **Appl. No.:** 524,439

[22] **Filed:** Aug. 18, 1983

[52] **U.S. Cl.** ..... D12/332; D12/341;  
D12/344

[58] **Field of Search** ..... D12/319-344;  
244/45 R, 45 A, 55, 13, 91, 199

[56] **References Cited**

**U.S. PATENT DOCUMENTS**

D. 256,905 9/1980 McComas et al. ..... 244/45 A  
4,240,597 12/1980 Ellis et al. ..... 244/199

**OTHER PUBLICATIONS**

Flight Int'l (May 1982), p. 1318 Rockwell's Forward-Sweep Demonstrator.

Automotive Engr. (1980 Dec.) p. 49, vol. 88 No. 12.

*Primary Examiner*—James M. Gandy  
*Attorney, Agent, or Firm*—Edwin L. Spangler, Jr.

[57] **CLAIM**

The ornamental design for an airplane, as shown.

**DESCRIPTION**

FIG. 1 is a perspective view looking down and forwardly upon the upper right rear of an airplane showing my new design;

FIG. 2 is a perspective view looking down and to the rear upon the upper right front thereof;

FIG. 3 is a top plan view thereof;

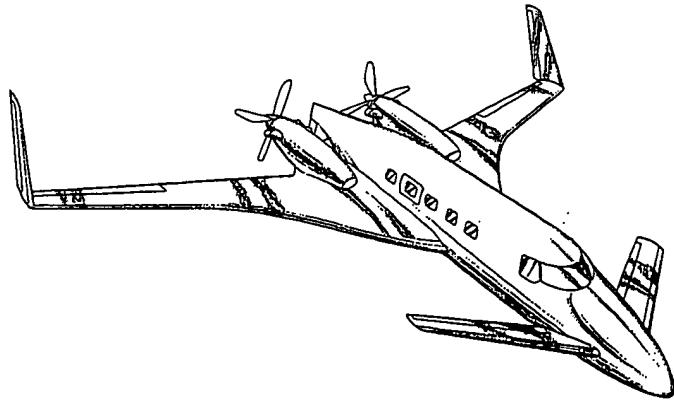
FIG. 4 is a front elevation view thereof;

FIG. 5 is a bottom plan view thereof;

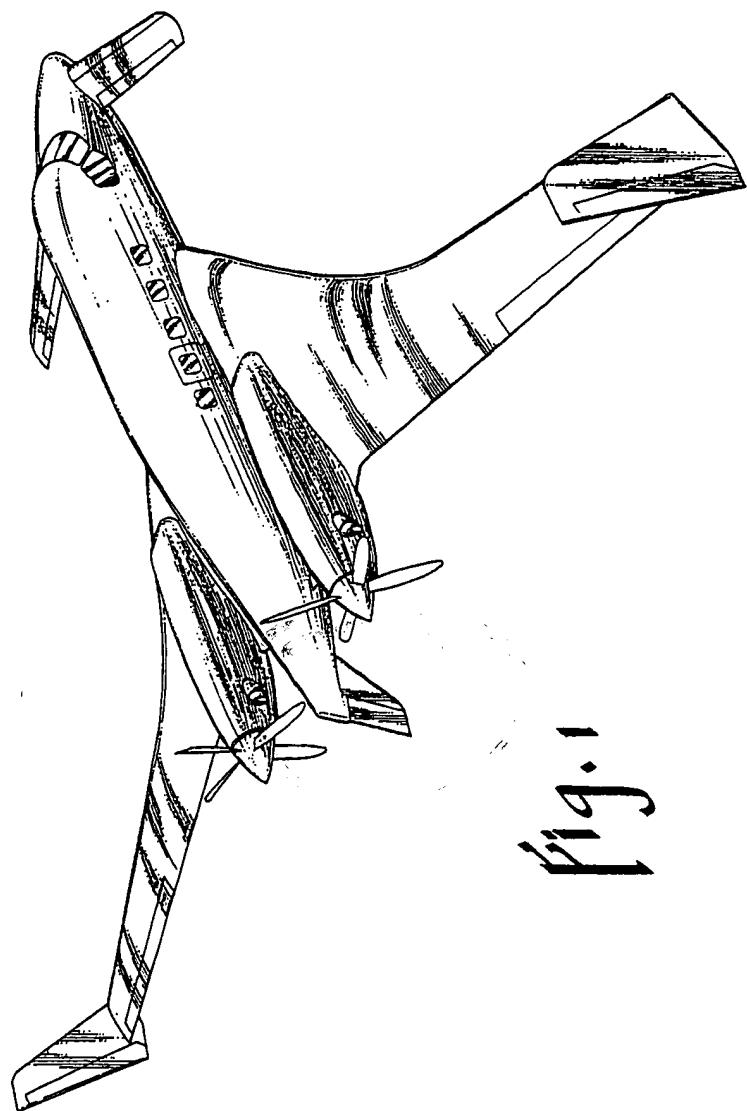
FIG. 6 is a rear elevation view thereof;

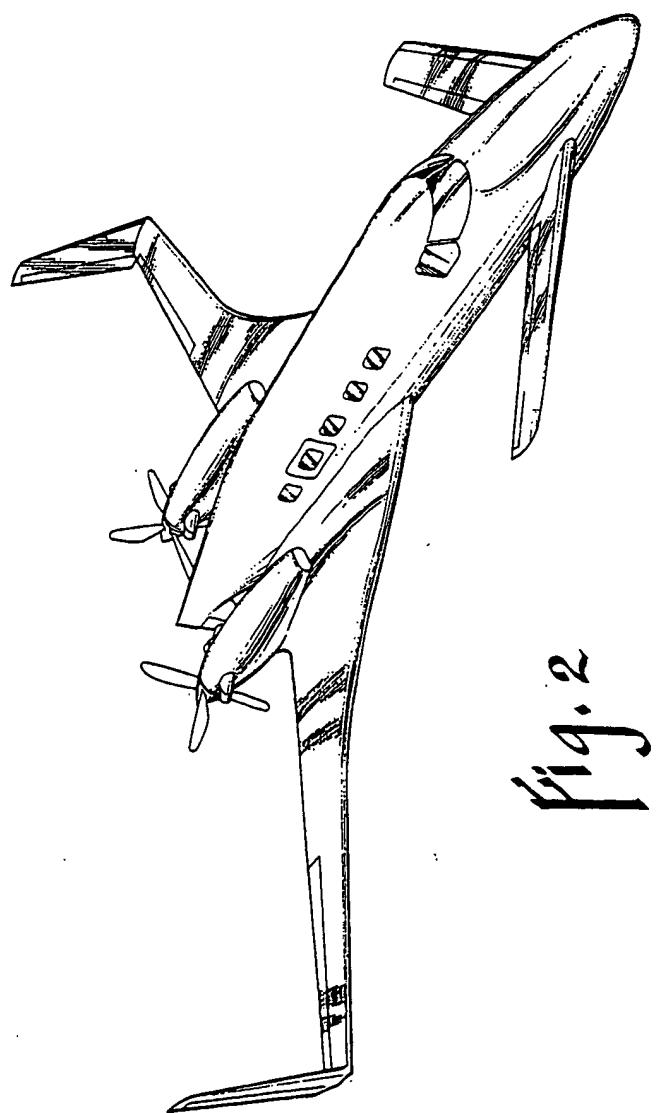
FIG. 7 is a left side elevation view thereof; and,

FIG. 8 is a right side elevation view thereof.



U.S. Patent Oct 20, 1987 Sheet 1 of 5 Des. 292,393





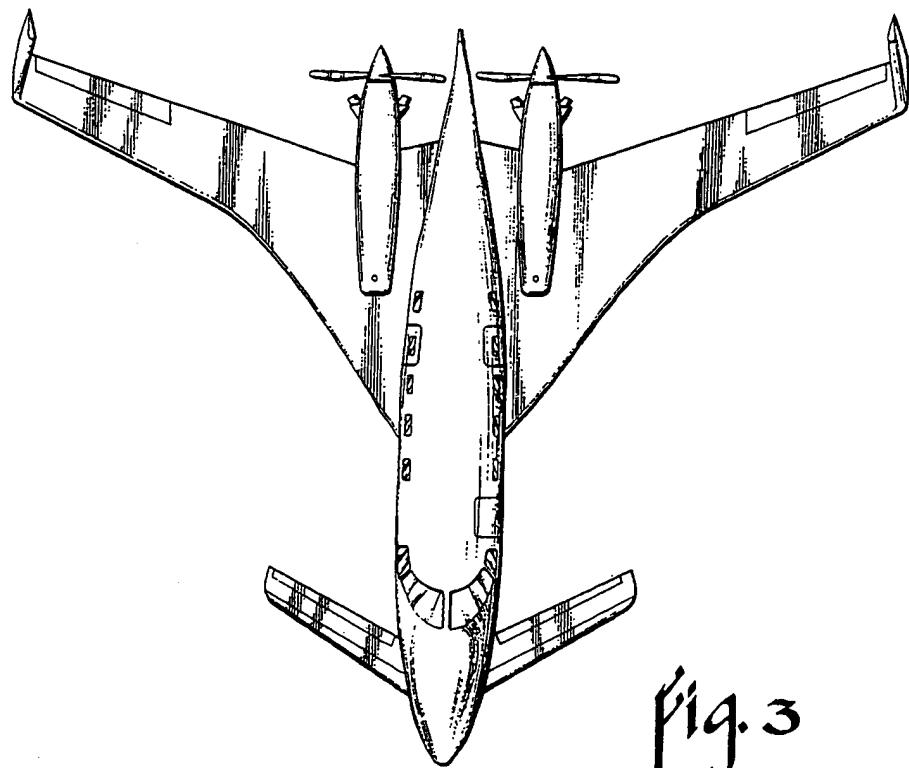


Fig. 3

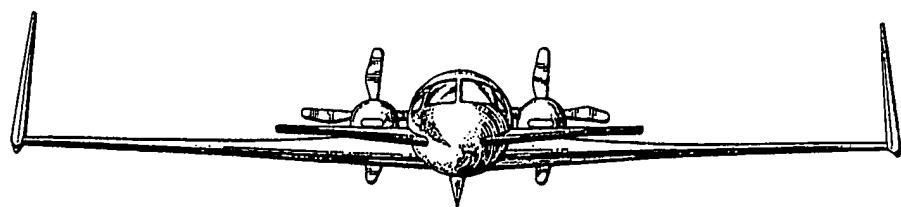


Fig. 4

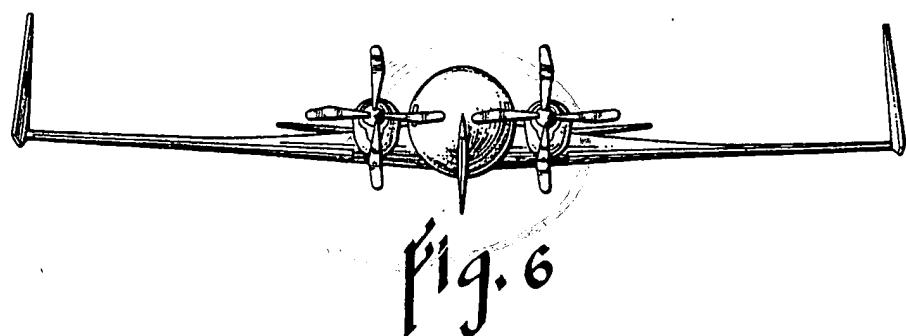


Fig. 6

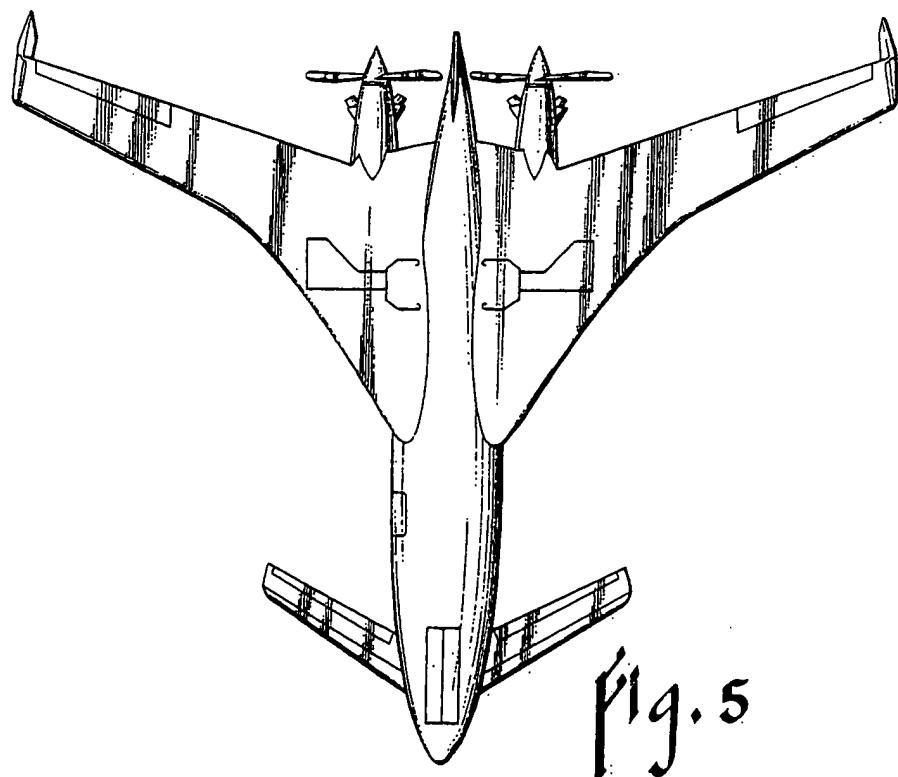
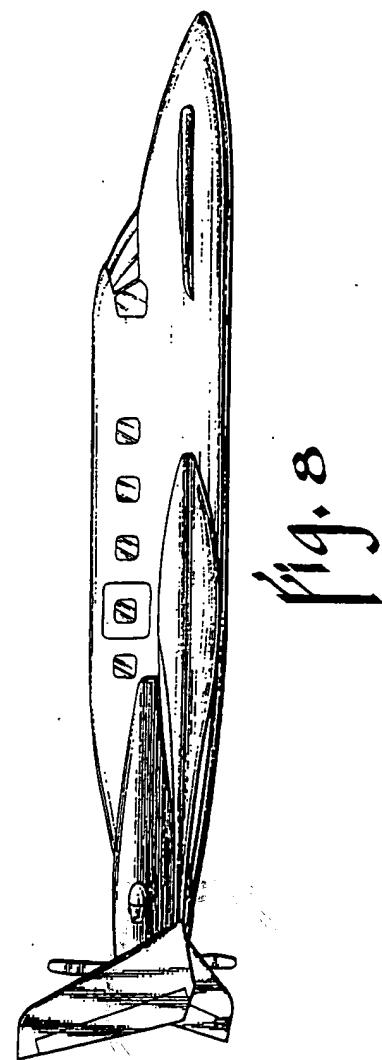
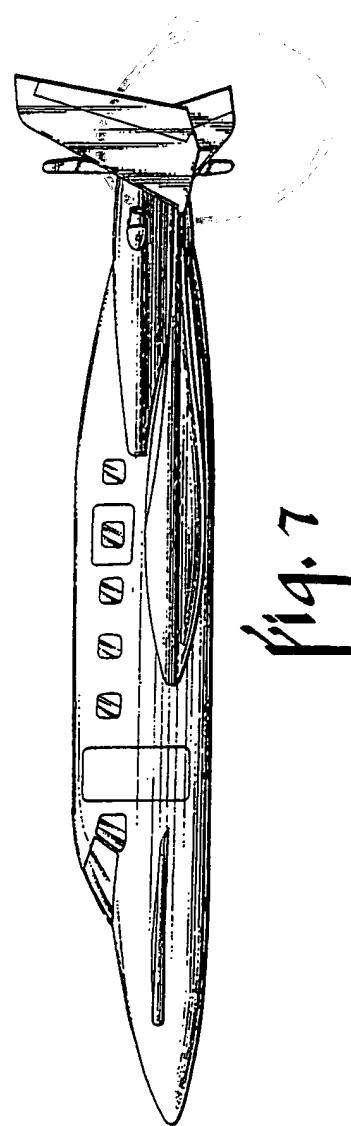
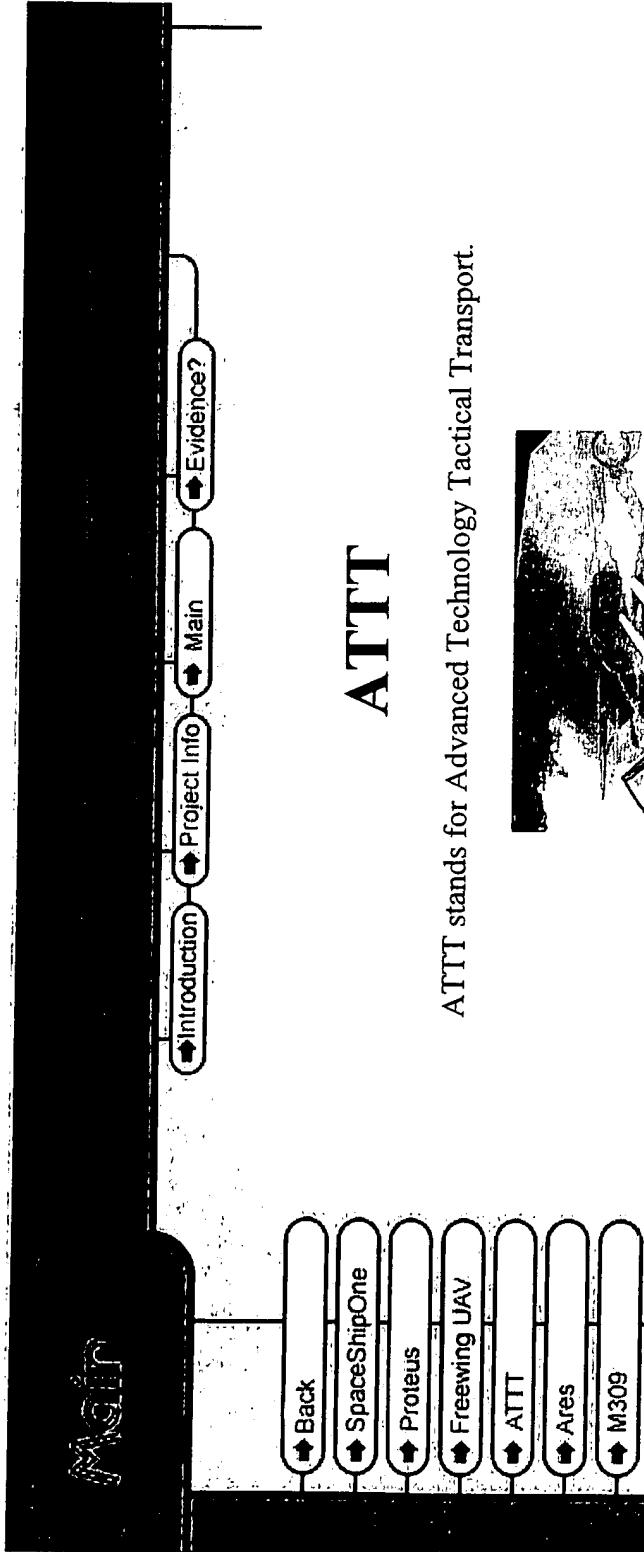


Fig. 5



**Attachment 5**

**Submitted in Response filed March 18, 2009  
to Office Action mailed February 18, 2009,  
“Entered” by the Examiner’s Subsequent Office Action of July 13, 2009**



The ATTT was developed and test flown by Scaled Composites, Inc. under contract to DARPA. The initial flight test program consisted of 51 flights with the original cruciform tail configuration, measuring and refining performance, stability and control, and handling qualities.

In an effort to improve the aft loading capability of the aircraft and to correct aerodynamic deficiencies discovered during the test program, the ATTT aircraft was modified with a twin-boom tail whose general configuration was similar to that of the Rockwell OV-10 Bronco. Below is a picture of a few Rockwell OV-10 Broncos flying in formation.



Pratt and Whitney of Canada PT6A-135A turboprop engines were attached to the twin booms in a tractor configuration. A simple fully mechanical flight control system was installed, with full control available from both seats. The Scaled-designed landing gear is actuated using electric motors.

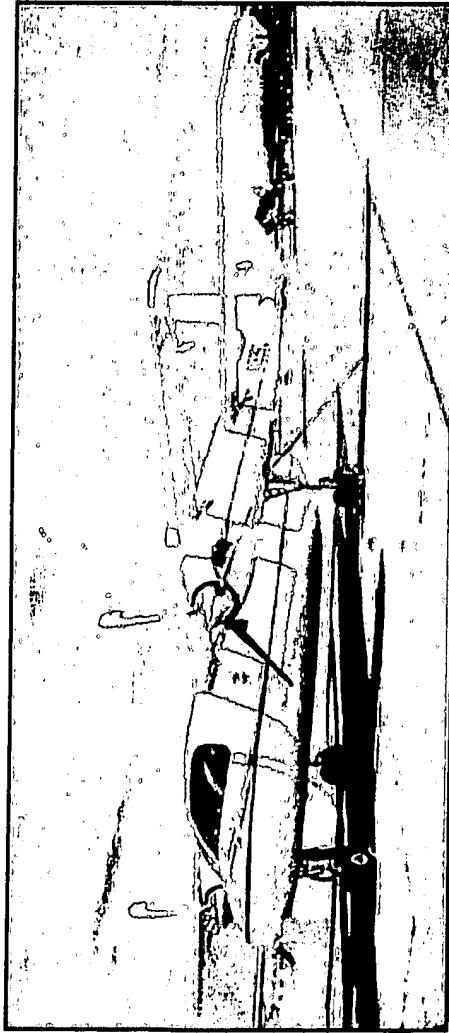


The high lift configuration consists of eight Fowler-type flaps, each of 43% chord. The flap system was designed to allow the initial takeoff roll to be performed with the flaps extended, but at low deflections to minimize takeoff drag. As rotation speed was neared, the flaps were quickly rotated to the maximum lift position via a separate pilot action. The ATTT was a key program for Scaled. It demonstrated their ability to perform a challenging aerodynamic and structural design, and to build, test, and deliver what amounted to two different manned research airplanes, including all design and flight test data, to DARPA for less than 3 million dollars, including all recurring and nonrecurring costs.

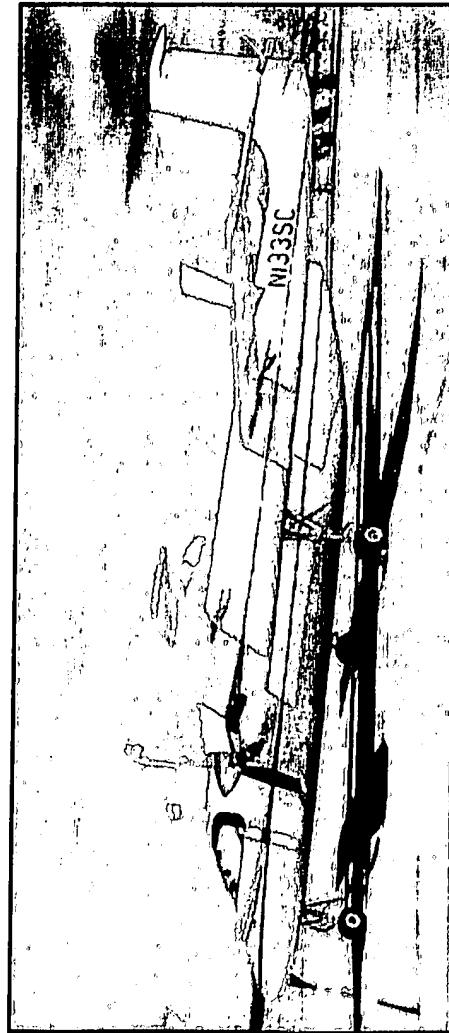
The ATTT is currently in storage at the Air Force Flight Test Center Museum, at Edwards Air Force Base.

## Model 33 Advanced Technology Tactical Transport (ATTT) demonstrator

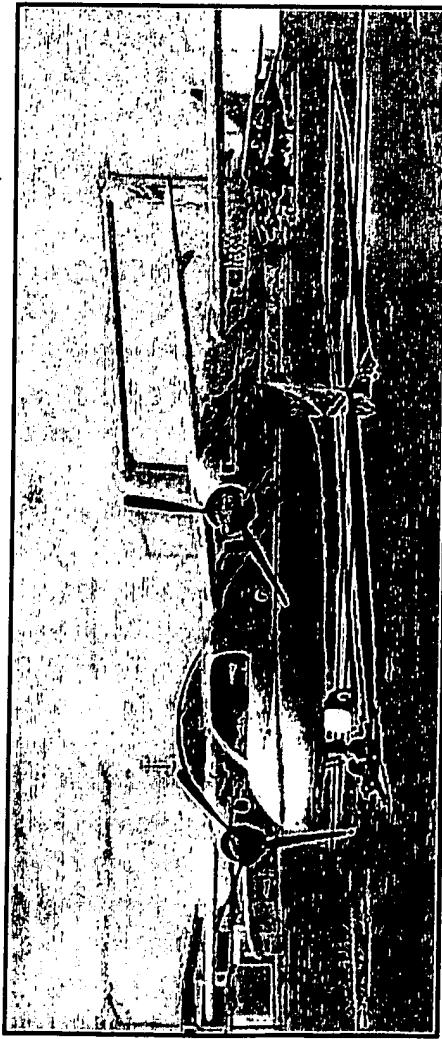
The Model 133-4-62 Advanced Technology Tactical Transport (ATTT) proof-of-concept demonstrator is a 62% scaled version of an airplane designed to challenging STOL and long range requirements. The ATTT was developed and test flown by Scaled Composites, Inc. under contract to DARPA.



Scaled Composites Model 33 Advanced Technology Tactical Transport (ATTT) demonstrator, N133SC on the Mojave Airport flightline on October 30, 1989. It was built in 1988 as a 68%-scale proof of concept vehicle.



Scaled Composites Model 33 Advanced Technology Tactical Transport (ATTT) demonstrator, N133SC on the Mojave Airport flightline on October 30, 1989.



Scaled Composites Model 33 Advanced Technology Tactical Transport (ATT) demonstrator, N133SC on the Edwards Air Force Base south base flightline on October 25, 2003.

**Attachment 6**

**Submitted in Response filed March 18, 2009  
to Office Action mailed February 18, 2009,  
“Entered” by the Examiner’s Subsequent Office Action of July 13, 2009**

We are presently building a list of all known canard type aircraft so that we may create dedicated reference pages for each. Based on demand, we can setup designated areas within the [forums](#).

Plane	Manufacturer	Designer	Type	Build	Fan Sites
1903 Wright Flyer	Wright Brothers	Orville & Wilbur	Ultralight	Plans	<a href="#">www</a>
Aeriks 200	<a href="#">Aceair</a>		Experimental	Kit	
Aerocanard	<a href="#">Aerocad</a>	Jeff Russell (based on Cozy Mark IV)	Experimental	Kit	<a href="#">www</a>
AFTI/F-16 (vertical canard)					<a href="#">www</a>
ARES	<a href="#">Scaled Composites, LLC</a>	Burt Rutan			
ATTT	<a href="#">Scaled Composites, LLC</a>	Burt Rutan			
Avanti P180	<a href="#">Piaggio Aero Industries S.p.A.</a>		GA	Complete	
B-1A/B Lancer/Bomber				Military	
Berkut	<a href="#">Berkut Engineering</a>	Dave Ronnenberg (based on Long EZ)	Experimental	Kit	<a href="#">www</a>
Catbird	<a href="#">Rutan Aircraft Factory, Inc.</a>	Burt Rutan			
Cosy Classic	<a href="#">Co-Z Development Corporation</a>	Nat Puffer (based on Long EZ)	Experimental	Plans	<a href="#">www 1</a> <a href="#">www 2</a>
Cozy Mark III	<a href="#">Co-Z Development Corporation</a>	Nat Puffer	Experimental	Plans	<a href="#">www 1</a> <a href="#">www 2</a>
Cozy Mark IV	<a href="#">Aircraft Spruce and Specialty Company (from Co-Z Development Corporation)</a>	Nat Puffer	Experimental	Plans	<a href="#">www 1</a> <a href="#">www 2</a>
Defiant	<a href="#">Rutan Aircraft Factory, Inc.</a>	Burt Rutan	Experimental	Plans	
Dragonfly	<a href="#">SlipStream Industries Inc.</a>	Bob Walters (based on Quickie)	Experimental	Kit	
Eagle 150B	<a href="#">Eagle Aircraft Pty. Ltd.</a>	John Roncz	GA	Complete	
E-Racer	<a href="#">Shirl Dickey Enterprises</a>	Shirl Dickey (based on Long EZ)	Experimental	Plans	<a href="#">www</a>
F 19a		Heinrich Focke			<a href="#">www</a>
F-21A Kfir	<a href="#">Israel Aircraft Industries</a>		Military		<a href="#">www</a>
Falcon (UL, XP)	<a href="#">American Aerolight</a>	Romuald Drlik	Ultralight, Experimental	Kit	<a href="#">www</a>
Falcon 2000	<a href="#">Air Command International, Inc.</a>	Romuald Drlik	Experimental	Kit	<a href="#">www</a>
Firefly	<a href="#">Velocity, Inc. (made by Shinyoung Heavy Industries Co., Ltd.)</a>	(based on Velocity XL)	Experimental	Kit	
Fw 42	<a href="#">Focke-Wulf Flugzeugbau AG</a>	Heinrich Focke	Military		<a href="#">www</a>
GB-888A	<a href="#">Burnelli Company</a>	Vincent Justus Burnelli			<a href="#">www</a>
Ibis	<a href="#">Junqua-Diffusion</a>	Roger Junqua	Experimental	Plans	
J7W1 "Shinden"	<a href="#">Kyushu Hikoki K. K.</a>	Masaoki Tsuruno	Military		<a href="#">www 1</a> <a href="#">www 2</a>
JAS 39 Gripen	<a href="#">BAE Systems and Saab</a>		Military		
Jian-10 (J-10 / F10)	China		Military		<a href="#">www</a>
	<a href="#">Lockheed Martin Aeronautics</a>				

KC-X	Company				www
LDA-01, LDA-1000	Boxer				www
Long EZ	<a href="#">Rutan Aircraft Factory, Inc.</a>	Burt Rutan, John Roncz	Experimental	Plans	www
MiG-35	MiG-MAPO		Military		www
Proteus	Scaled Composites, LLC	Burt Rutan			
Quickie	Quickie Aircraft Corporation	Burt Rutan, Tom Jewett, Gene Sheehan	Experimental	Plans	www
Quickie Q2	Quickie Aircraft Corporation	Burt Rutan, Tom Jewett, Gene Sheehan	Experimental	Kit	www
Quickie Q200	Quickie Aircraft Corporation	Burt Rutan, Tom Jewett, Gene Sheehan	Experimental	Kit	www
Rafale	Dassault		Military		
S-37 "Berkut"	Sukhoi		Military		www
Solitaire	<a href="#">Rutan Aircraft Factory, Inc.</a>	Burt Rutan	Experimental		
Speed Canard	Gyroflug		GA		
SQ2000	<a href="#">KLS Composites, Inc.</a>		Experimental	Kit	
Starship (Model 2000)	<a href="#">Raytheon Aircraft Company</a> (Beech Aircraft Corporation)	Burt Rutan	GA	Complete	www
Stratos		Charles Ligeti	Experimental		www
Triumph	Scaled Composites, LLC	Burt Rutan			
Tu-144	PSC Tupolev				www
Typhoon	<a href="#">Eurofighter</a>		Military		
VariEze	<a href="#">Rutan Aircraft Factory, Inc.</a>	Burt Rutan	Experimental	Plans	
VariViggen	<a href="#">Rutan Aircraft Factory, Inc.</a>	Burt Rutan	Experimental	Plans	
Velocity	<a href="#">Velocity Inc.</a>	Dan Maher (based on Long EZ)	Experimental	Kit	www
Viggen 37	Saab		Military		www
Voyager		Burt Rutan			
X-29					www
X-31A	Rockwell International				www
X-50 Dragonfly UAV/VTOL	Boeing				www
XB-70A Valkyrie					www
XP-55 Ascender	Curtiss-Wright	Donovan Berlin	Military		www

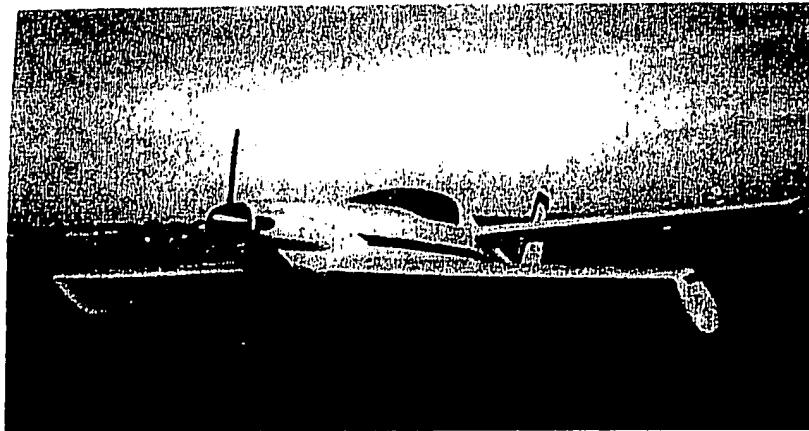
Please submit any missing aircraft information and links to the [site administrator](#).

**Attachment 7**

**Submitted in Response filed March 18, 2009  
to Office Action mailed February 18, 2009,  
“Entered” by the Examiner’s Subsequent Office Action of July 13, 2009**

# Dragonfly

C



The Dragonfly is a low cost, homebuilt sport plane with a canard planform. The canard design provides low wing loading to produce exciting performance with a VW based engine. This 2 place composite design can be built from plans or can be quick built using pre-fab parts. The Dragonfly was awarded "Best New Design" at the EAA's 1980 Oshkosh Convention.

## DRAGONFLY SPECIFICATIONS

Span	22'
Length	19'
Engine	2180 70HP VW
Empty Weight	600 LBS
Useful Load	545 LBS. MAX.
Wing Area	92.2 SQ. FT.
Seats	2 SIDE BY SIDE

## DRAGONFLY PERFORMANCE

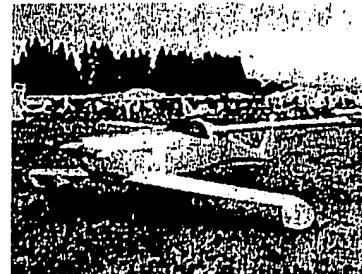
Take Off Distance	1200 FT
Stall	48 MPH
Landing Speed	N/A
Cruise	165 MPH
Rate Of Climb	850 FPM

# Quickie Aircraft

C

From Wikipedia, the free encyclopedia  
(Redirected from Quickie Aircraft Corporation)

The **Quickie Aircraft Corporation** was founded in Mojave, California, in 1978 to market the Quickie homebuilt aircraft (models **Quickie**, **Quickie Q2**, and **Quickie Q200** aircraft) which were designed by Burt Rutan and founders Gene Sheehan and Tom Jewett. Now defunct, the company sold over 2,000 kits in its lifetime.

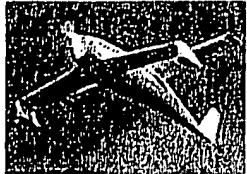


A Quickie Q2, with vortex generators on the canard.

## External links

- Quickie Plans History Newsletters and Discussion Forum (<http://www.quickheads.com/>)
- Aerofiles.com data on QAC ([http://www.aerofiles.com/\\_pl.html#\\_Q](http://www.aerofiles.com/_pl.html#_Q))
- Quickie Builders Files and Photos ([http://imageevent.com/qdf\\_files](http://imageevent.com/qdf_files))

## Gallery



QAC Quickie Q2 in flight



QAC Quickie Q2, canopy up



QAC Quickie Q2, side view

Retrieved from "[http://en.wikipedia.org/wiki/Quickie\\_Aircraft](http://en.wikipedia.org/wiki/Quickie_Aircraft)"

Categories: Aeronautical company stubs | Aircraft manufacturers of the United States

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**(x) RELATED PROCEEDINGS APPENDIX**

1                   UNITED STATES PATENT AND TRADEMARK OFFICE

2

3

4                   BEFORE THE BOARD OF PATENT APPEALS  
5                   AND INTERFERENCES

6

7

8                   *Ex parte* FRANK C. SMITH, JR.

9

10

11                   Appeal 2007-2901  
12                   Application 10/701,146  
13                   Technology Center 3600

14

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16                   Decided: December 12, 2007

17

18

19 *Before* WILLIAM F. PATE III, MURRIEL E. CRAWFORD, and  
20 JENNIFER D. BAHR, *Administrative Patent Judges*.

21

22 PATE, III, *Administrative Patent Judge*.

23

24                   DECISION ON APPEAL

25

26                   STATEMENT OF CASE

27

28                   The Appellant appeals under 35 U.S.C. § 134 (2002) from a final  
29 rejection of claims 1 to 11. We have jurisdiction under 35 U.S.C. § 6(b)  
30 (2002).

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2Application 10/701,146  
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1        The Appellant claims a canard design aircraft that includes an opening  
2 at the rear of the fuselage with a door for allowing loading of objects into the  
3 aircraft.

4        Independent claims 1 and 11 read as follows:

5            1. A cargo adapted aircraft, comprising:  
6                a canard having two and only two significant horizontal  
7                lifting surfaces, with a smaller lifting surface in front of a larger  
8                lifting surface; and  
9                a large opening at the rear of the fuselage through which  
10              objects can be loaded, the opening having a door type of  
11              closure for flight.

12  
13            11. A cargo-adapted personal aircraft, comprising:  
14                a canard having two significant horizontal lifting surfaces  
15                with a smaller lifting surface in front of a larger lifting surface;  
16                a large opening at the rear of the fuselage through which  
17                objects can be loaded; and  
18                having no empennage.

19        The prior art relied upon by the Examiner in rejecting the claims is:

21	Sutton	2,492,245	Dec. 27, 1949
22	Weaver	2,759,691	Aug. 21, 1956
23	Rutan	4,641,800	Feb. 10, 1987
24	Firestone	3,572,615	Mar. 30, 1971

25  
26        Claims 1-11 were rejected under 35 U.S.C. § 112, second paragraph,  
27 as being indefinite.

28        Claims 1-6 and 8-11 were rejected under 35 U.S.C. § 103(a) as  
29 unpatentable over Sutton in view of Weaver and Rutan.

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7Application 10/701,146  
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1       Claim 7 was rejected under 35 U.S.C. § 103(a) as unpatentable over  
2 Sutton in view of Weaver, Rutan, and Firestone.

3 We AFFIRM-IN-PART and REMAND for further proceedings  
4 consistent with this DECISION.

5

## ISSUES

7 1. Whether the Appellant has shown that the Examiner erred in  
8rejecting claims 1-11 as being indefinite.

9        2. Whether the Appellant has shown that the Examiner erred in  
10 rejecting claims 1-6 and 8-11 as unpatentable over Sutton in view of Weaver  
11 and Rutan.

12        3. Whether the Appellant has shown the Examiner erred in rejecting  
13 dependent claim 7 as unpatentable over Sutton in view of Weaver, Rutan,  
14 and Firestone.

15

## FINDINGS OF FACT

17 The record supports the following findings of fact (FF) by a  
18 preponderance of the evidence.

19 1. Sutton discloses a tail-less, "flying wing" design aircraft (Fig. 1;  
20 Col. 1, 52-Col. 2, l. 4).

21        2. Weaver discloses an aircraft 10 with cargo loading door 17 at the  
22 rear end of the fuselage 12 (Figs. 1-3; Col. 2, ll. 40-49).

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12Application 10/701,146  
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1       3. Rutan '800 discloses a canard design aircraft 10 having only two  
2horizontal lifting surfaces with a smaller lifting surface 16 in front of a larger  
3lifting surface 14 (Figs. 1-3; Col. 4, ll. 26-34).

4       4. Rutan '800 also discloses a canard design aircraft without booms  
5or an empennage (Figs. 1-3).

6       5. The Appellant states that “[p]rior ‘canard’ designs for cargo-  
7oriented craft that incorporated a rear fuselage door, the only known design  
8being the Rutan ATTT, have utilized three horizontal lifting surfaces,  
9including a boom-supported tail empennage” (Spec. 3, ll. 9-11). Thus, a  
10canard design, cargo-oriented aircraft with a rear fuselage door is known.

11       6. The Appellant further states “[e]xperience flying model canards,  
12constructing an experimental canard, accompanying Mr. Rutan flying an  
13experimental canard, being connected to the Voyager project and witnessing  
14a single tractor engine successfully tested with a canard, all convinced the  
15instant inventor that the canard design was a cost effective feasible solution”  
16(App. Br. 5, ll. 9-12). Thus, a canard design aircraft with a single tractor  
17engine has been successfully tested.

18  
19

#### PRINCIPLES OF LAW

20       35 U.S.C. § 112, second paragraph, recites that “[t]he specification  
21shall conclude with one or more claims particularly pointing out and  
22distinctly claiming the subject matter which the applicant regards as his  
23invention.” Claims are in compliance with 35 U.S.C. § 112, second  
24paragraph, if “the claims, read in light of the specification, reasonably

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17Application 10/701,146

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1apprise those skilled in the art and are as precise as the subject matter  
2permits.” *Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367,  
31385 (Fed. Cir. 1986). When a claim uses a word of degree, like  
4“substantially,” the Specification must be examined to determine whether  
5some standard for measuring that degree is provided and whether one of  
6ordinary skill in the art would understand what is claimed when the claim is  
7read in light of the Specification. *Seattle Box Co. v. Industrial Crating &*  
8*Packing, Inc.*, 731 F.2d 818, 826 (Fed. Cir. 1984).

9        In addition, 35 U.S.C. § 103 “forbids issuance of a patent when ‘the  
10differences between the subject matter sought to be patented and the prior art  
11are such that the subject matter as a whole would have been obvious at the  
12time the invention was made to a person having ordinary skill in the art to  
13which said subject matter pertains.’” *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct.  
141727, 1734 (2007). The Supreme Court reaffirmed the principle that “[t]he  
15combination of familiar elements according to known methods is likely to be  
16obvious when it does no more than yield predictable results.” *KSR*, 127  
17S.Ct. at 1739. The Court further explained that “[o]ften, it will be necessary  
18for a court to look to interrelated teachings of multiple patents; the effects of  
19demands known to the design community or present in the marketplace; and  
20the background knowledge possessed by a person having ordinary skill in  
21the art, all in order to determine whether there was an apparent reason to  
22combine the known elements in the fashion claimed by the patent at issue.”  
23*Id.* at 1740-41. The Court noted that “[t]o facilitate review, this analysis  
24should be made explicit.” *Id.*, citing *In re Kahn*, 441 F.3d 977, 988 (Fed.

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22Application 10/701,146  
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1Cir. 2006) (“[R]ejections on obviousness grounds cannot be sustained by  
2mere conclusory statements; instead, there must be some articulated  
3reasoning with some rational underpinning to support the legal conclusion of  
4obviousness”). However, “the analysis need not seek out precise teachings  
5directed to the specific subject matter of the challenged claim, for a court  
6can take account of the inferences and creative steps that a person of  
7ordinary skill in the art would employ.” *Id.* at 41.

8

9

10

## 11 ANALYSIS

### 12 Rejection of claims 1-11 under 35 U.S.C. § 112

13 The Examiner states that the term “significant” in the limitation “two  
14significant horizontal lifting surfaces” of independent claims 1 and 11 is  
15indefinite because the term is vague, raising the question as to what  
16qualifies as a significant horizontal lifting surface (Ans. 3, l. 19-Ans. 4, l. 2).

17 The Appellant contends that in view of the Specification, one of  
18ordinary skill would understand what is being claimed (App. Br. 3, ll. 31-  
1934). In support, the Appellant refers to portions of the Specification stating  
20parenthetically that “significant” means non trivial and non *de minimis*  
21(Spec. 4, l. 29-32). We agree with the Appellants that the term “significant”  
22does not render claims 1-11 indefinite in the present case.

23 Even though the term “significant” is a term of degree as the  
24Examiner notes, the claim limitation “significant horizontal lifting surfaces,”

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1reasonably apprises those skilled in the art as to the claim scope when read  
2in light of the Specification, and the term is as precise as the subject matter  
3permits. *Hybritech*, 802 F.2d at 1385; *Seattle Box*, 731 F.2d at 826. While  
4the terms “non trivial” and “non *de minimus*” set forth in the Specification to  
5clarify the meaning of “significant” are also relative terms, these terms assist  
6one of ordinary skill in the art of aviation in understanding that the  
7horizontal lift surfaces must be more than trivial and *de minimus*. The term  
8is also as precise as the subject matter permits because it would be difficult  
9for the Appellant to specifically quantify what constitutes a “significant  
10horizontal lifting surface.” A lifting surface having a specific dimension may  
11be important in the proper functioning of a small, light-weight aircraft, or be  
12entirely trivial and *de minimus* in a large, heavy aircraft. We believe this  
13fact will be appreciated by one of ordinary skill in the art. Therefore, in  
14view of the above, the Appellant has shown that the Examiner erred in  
15rejecting claims 1-11 based on the term “significant.”

16        The Examiner also rejected claims 1-10 as being indefinite because of  
17the term “type” in the limitation “door type of closure.” The Examiner cited  
18MPEP § 2173.05(b) E which states that addition of the word “type” can  
19render indefinite an otherwise definite expression (Ans. 3, ll. 16-18). We  
20agree.

21        The only instance in the Specification where similar language is found  
22states “any number of door types and closure arrangements could be  
23utilized” (Spec. 5, ll. 30-31). The Specification also states that “[m]any  
24other means for closure of openings are known and would be operable.”

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1(Spec. 5, ll. 4-7). The Appellant has argued in the Appeal Brief that there  
2could be a spectrum of other types of closures for the opening including a  
3permanently sealed or welded shut type of closure, although such closures  
4do not appear to be described in the Specification (App. Br. 4, ll. 15-17).  
5The Specification appears to merely describe various embodiments of  
6“doors,” without any specific discussion as to what would constitute a “door  
7type of closure” that suggests something more inclusive than just doors.  
8Thus, the inclusion of the word “type” to the otherwise definite expression  
9“door” renders claims 1-10 indefinite because it extends the claim scope and  
10makes it unclear as to what the term “type” was intended to convey. *Ex*  
11*parte Copenhaver*, 109 USPQ 118 (Bd. App. 1955). Hence, the Appellant  
12has not shown that the Examiner erred in rejecting claims 1-10 as being  
13indefinite, but has shown that the Examiner erred in rejecting claim 11 as  
14being indefinite.

15

16       Rejection of claims 1-6, and 8-11 under 35 U.S.C. § 103

17       In rejecting these claims, the Examiner asserts that it would have been  
18obvious to one of ordinary skill in the art to modify the “flying wing”  
19aircraft of Sutton by adding a door at the rear of the fuselage as disclosed in  
20Weaver to “allow easy loading and unloading of cargos” (FFs 1 and 2; Ans.  
214, ll. 5-17). The Examiner further asserts that it would have been obvious to  
22one of ordinary skill in the art to add canard wings of Rutan ‘800 to  
23“improve maneuverability” of the flying wing aircraft of Sutton (FF 3; Ans.  
244, ll. 5-17).

1        The Appellant argues that the Examiner erred in that there is no  
2 motivation to modify the flying wing of Sutton to provide the door of  
3 Weaver, or to provide canard wing disclosed in Rutan '800 (App. Br. 6, l. 5-  
4 App. Br. 7, l. 23; Reply 1, 13-Reply 3, l. 20). The Appellant further  
5 contends that Sutton teaches away from adding a canard to the disclosed  
6 flying wing aircraft (Reply 3, 21-Reply 5, l. 9).

7        We agree with the Appellant that one of ordinary skill in the art would  
8 not be motivated to modify the "flying wing" aircraft of Sutton to  
9 incorporate a canard wing of Rutan to thereby "improve maneuverability" as  
10 asserted by the Examiner. Sutton does not suggest or teach desirability of a  
11 canard wing, but rather proposes improvements to the flying wing design to  
12 enhance control of diving moments and longitudinal stability (Col. 1, l. 52-  
13 Col. 2, l. 4). As noted by the Appellant, Sutton appears to teach away from  
14 the modification suggested by the Examiner by noting the use of an auxiliary  
15 lifting surface forward of the center of gravity in the art (i.e. canard wing),  
16 but not incorporating such an auxiliary lifting surface into the flying wing  
17 aircraft disclosed (Col. 1, l. 29-36; Br. 7, ll. 1-8). Rutan '800 is directed to a  
18 canard design aircraft with canard wings that can be pivoted to achieve high  
19 lift (Col. 3, ll. 18-30).

20        While the Examiner need not seek out precise teachings directed to  
21 the specific subject matter of the claim, the Examiner must provide a rational  
22 basis for combining the references in the manner suggested. We do not  
23 believe that the Examiner's reasoning for providing a canard wing on a  
24 flying wing design aircraft is rational because in addition to Sutton teaching

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1away from the modification suggested, there is no evidence of reasonable  
2expectation for success that such a modified aircraft would be functional,  
3especially considering that wing configuration is a fundamental aspect of an  
4aircraft (Br. 7, ll. 15-20). Therefore, because the Examiner has not provided  
5a rational basis for combining the references in the manner suggested, the  
6Examiner erred in rejecting claim 1, as well as claims 2-6 and 8-11  
7dependent thereon, as unpatentable over Sutton in view of Weaver and  
8Rutan.

9 The Appellant also separately argued that the Examiner’s rejection of  
10 claims 5, 6, and 11 under 35 U.S.C. § 103 is improper in view of the  
11 definitions for the recited “light personal aircraft” and “personal aircraft” set  
12 forth in the Specification (Spec. 5, ll. 8-11; App. Br. 7, ll. 25-30). However,  
13 the Appellant’s arguments are moot in view of the above finding of  
14 Examiner error regarding independent claim 1.

15

16 Rejection of claim 7 under 35 U.S.C. § 103

17 For the reasons set forth above relative to claim 1, and because the  
18Examiner's application of Firestone does not remedy the deficiency of the  
19combination of Sutton, Weaver, and Rutan discussed above, the Examiner's  
20rejection of claim 7 under 35 U.S.C. § 103 is cannot be sustained.

21

22 **REMAND TO THE EXAMINER**

23

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1 The present Appeal is REMANDED to the Examiner to make  
2 additional factual findings and conclusion of law as to:

3       A. Whether claims 1-6 and 8-11 would have been obvious to one  
4       of ordinary skill in the art in view of Rutan ATTT which is a  
5       canard design aircraft for cargo use that includes a door at the rear  
6       of the fuselage and Rutan '800 that discloses a canard aircraft  
7       without an empennage and having only two significant horizontal  
8       lifting surfaces (FFs 3-5).

10 B. Whether claim 7 would have been obvious to one of ordinary  
11 skill in the art in view of Rutan ATTT and Rutan '800, in further  
12 view of the Appellant's statement that successful testing of a  
13 canard design aircraft with a single tractor engine was witnessed  
14 (FF 6).

## CONCLUSIONS OF LAW

## ORDER

18 1. The Examiner's rejection of claims 1-10 as being indefinite is  
19 AFFIRMED.

20        2. The Examiner's rejection of claim 11 as being indefinite is  
21 REVERSED.

22 3. The Examiner's rejection of claims 1-6 and 8-11 as unpatentable  
23 over Sutton in view of Weaver and Rutan is REVERSED.

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1        4. The Examiner's rejection of claim 7 as unpatentable over Sutton in  
2 view of Weaver, Rutan and Firestone is REVERSED.

3 The present Appeal is REMANDED to the Examiner to make  
4 additional factual findings and conclusion of law.

5        No time period for taking any subsequent action in connection with  
6this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R.  
7§ 1.136(a)(1)(iv) (2006).

8

**AFFIRMED-IN-PART; REMANDED**

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13vsh

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15

16SUE Z. SHAPER, P.C.

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19HOUSTON TX 77027